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IDENTIFIERS *Dixon Public Schools IL

ABSTRACT

Learning activities; lesson plans, and various resource materials are contained in this guide for the fifth grade outdoor education program in the Dixon Public Schools, Dixon, Illinois. Well over 100 activities are suggested, and many of these are described in detail. Although some information is specific to the Dixon program, which has access to a large camp with wilderness areas, most activities can be adapted to any outdoor environment. Activities for the classroom and the outdoors are organized under the following subject areas: mathematics, social studies, language arts, natural sciences, reading, and the arts; winter outdoor activities are also listed. The section on the natural sciences lists 22 activities including study of local geology, exploration of streams and ponds, and observation and prediction of weather. In addition to lesson plans, student worksheets, and quizzes, a wide variety of background information is provided on plant and animal identification, regional geological history including glaciation, and rock and fossil identification. Math activities use the environment to learn measuring and estimating distances, quantities, and velocity; both metric and standard units are used, and charts and other information for metric conversion are included. (JH)

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DIXON PUBLIC SCHOOLS

OUTDOOR EDUCATION

5TH GRADE

Compiled By
Jean Harris
and
Others

1977

Dixon Public Schools
415 S. Hennepin Avenue
Dixon, Illinois 61021

RC 011546

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
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Studying Insects
Studying Soil
Studies for Open Places
Studies for Streams
Studying Mammals
Studies for Woodlands
Studying Birds

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The Reptiles
The Plants
The Mammals

ENCHANTMENT OF AMERICA SERIES

Illinois - From Its Glorious Past to the Present

EXAMINING YOUR ENVIRONMENT SERIES

The Dandelion
Birds
Trees
Snow and Ice
Running H_2O
Pollution
Mini-Climates

PEOPLE AND THEIR ENVIRONMENT

Teachers' Curriculum Guide to Conservation Education (1-12 Outdoor Laboratory)

Teachers' Curriculum Guide to Conservation Education (Grades 4-5-6)

NATIONAL WILDLIFE FOUNDATION

Nature Hunt (An Environmental Investigation)

OBIS Trial Edition, Set I)
OBIS Trial Edition, Set II) in each school library

Tips and Tricks in Outdoor Education -- in each school

Ten Minute Field Trips -- in each school

Outdoor Education by Mand -- one copy per teacher

OUTDOOR EDUCATION

1. Outdoor Education Instructional Materials Packet - Lorado Taft
2. Benson, Kenneth, Creative Nature Crafts, Prentice-Hall, Inc., Englewood, Cliffs, New Jersey, 1968 (97 pp.)
3. Brehm, Shirley A., A Teacher's Handbook for Study Outside the Classroom, Charles E. Merrill Publishing Co., Columbus, Ohio, 1969 (100 pp.)
4. Hammerman, Donald & Hammerman, Wm. M., Teaching in the Outdoors, Burgess Publishing Co., Minneapolis, Minn., 1964 (120 pp.)
5. Hammerman, Donald R. & Hammerman, Wm. M., Outdoor Education, A Book of Readings, Burgess Publishing Company, Minneapolis, Minn., 1968 (401 pp.)
6. Hug, John W. and Wilson, Phyllis, Curriculum Enrichment Outdoors, Harper & Row, Publishers, Evanston, Ill., 1965 (214 pp.)
7. Mand, Charles L., Outdoor Education, J. Lowell Pratt and Company, New York, 1967 (180 pp.)
8. Schramm, Wilber, Classroom Out-of Doors, Sequoia Press Publishers, Kalamazoo, Michigan, 1969 (193 pp.)
9. Smith, Julian W. and others, Outdoor Education, Prentice-Hall, Inc., Englewood Cliffs, NJ, 1963 (322 pp.)
10. Swan, Malcolm D. (editor), Tips and Tricks in Outdoor Education, Interstate Printers & Publishers, Inc., Danville, IL, 1970 (184 pp.)
11. Van Der Smissen, Betty & Goering, Oswald H., Nature Oriented Activities, The Iowa State University Press, Ames, Iowa, 1965 (219 pp.)

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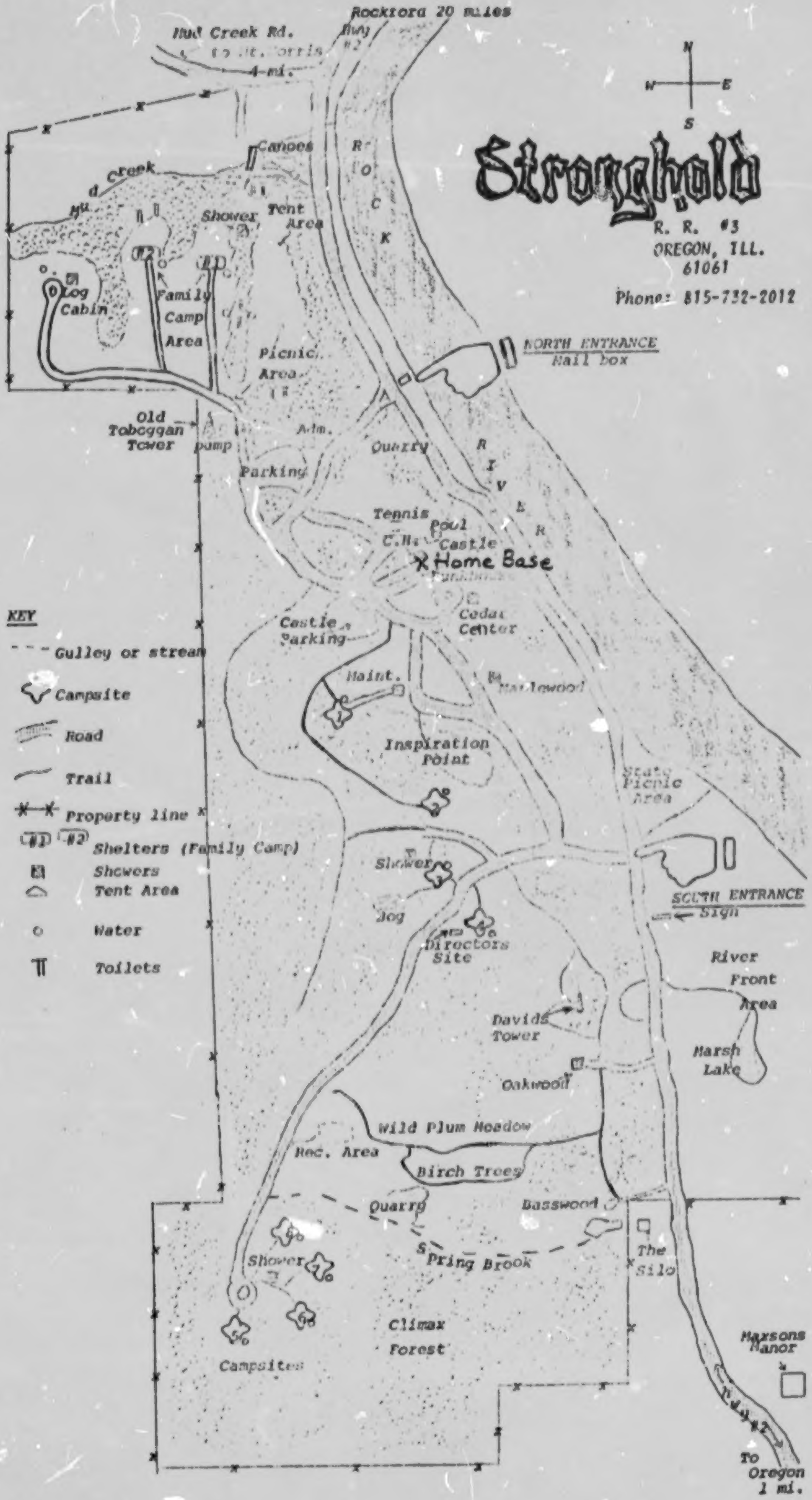
The following materials are available for your use. They may be checked out by calling Carol Leslie (288-2454).

MATH

4	trundle wheel (1m)
4	plane table
29	compass - 11 (18 new)
1	lg. demo compass
5	meter sticks (1m)
3	calliper
1	folding meter tape
2	thermometer
25	30cm rule
2	square metre sticks
1	100cm stick
10	tape measures
1	20m tape
1	50m tape
1	map measure
1	micrometer
1	2m steel tape

	Rock and minerals of IL
1	seine
2	plankton nets
2	dip nets
2	white granite pans
6	strainers
15	clipboards
3	hammers
24	magnifiers
20	blindfolds


Stronghold
R. R. #3
OREGON, ILL.
61061
Phone: 815-732-2012
N
W
E
S
Rockford 20 miles
Hwy #2
Mud Creek Rd.
to Mt. Morris
4 mi.
Canoes
Mud Creek
Shower
Tent Area
#2
#1
Log Cabin
Family Camp Area
Picnic Area
Old Toboggan Tower
pump
Adm.
Parking
Quarry
R O C K
R I V E R
NORTH ENTRANCE
Mail box
Tennis
Pool
C.H.
Castle
Home Base
Castle Parking
Cedar Center
Maint.
Maplewood
1
Inspiration Point
2
State Picnic Area
Shower
Bog
Directors Site
SOUTH ENTRANCE
Sign
River Front Area
Davids Tower
Marsh Lake
Oakwood
Wild Plum Meadow
Rec. Area
Birch Trees
Quarry
Basswood
The Silo
Spring Brook
Shower
Climax Forest
Campsites
Maxsons Manor
Hwy #2
To Oregon 1 mi.
KEY
Gulley or stream
Campsite
Road
Trail
Property line
#1 #2 Shelters (Family Camp)
Showers
Tent Area
Water
Toilets

Ways of Learning Math in the Out of Doors

Learn to use measuring instruments: silva compass, rulers, tapes, quarts, gallons, rods, etc.

Compass hikes.

Develop capacity for estimating distances, time, quantities, space, velocity.

Figure age of tree -- ring count of stump; take measurements of circumference and diameters of trees.

Measure areas of land: Lay out acre in many different perimeter figures.

Measure pacing -- be ready to map by use of pacing thereafter.

Measure percentage of slopes.

Estimate heights of trees, hills; widths of gullies, streams, rivers, rates of speed; temperature readings, etc.

Average all of the estimated figures.

Find geometric shapes in nature.

Learn metric system.

Math Activities for Outdoor Education

Materials needed for these activities:

- Three or four thermometers
- Stop watch or watch with second hand
- Meter sticks
- Rulers
- Yardsticks
- 50 or 100 feet measuring tape
- 200 ft. of string
- Colored toothpicks
- String
- Pencils, paper

Activities

1. Determine the number of blades of grass in one square foot after determining the number of blades of grass in one square inch. Rulers can be used to measure the square inch and toothpicks can be used to stake out the small area. You could use metrics and begin with one square centimeter and then determine the number of blades in a square decimeter (or even a meter, although the number would be large.)

2. Centimeter hike. Take a short hike asking each student to find as many objects as possible that are one centimeter in length or width. After returning from the hike, actually measure the objects to see how close they come to being a centimeter.

3. Lay out a rectangular pasture using stakes or students as posts. Make the pasture six posts long on each side with three posts on each short side. Have the students find the perimeter and area of the pasture if each post is three meters apart.

4. In an open field, place a marker in position with twine attached. Extend the twine for 200 ft.
    a. Have students guess a 100 ft. distance from the marker. Compare the guesses.
    b. Estimate the 100 ft. distance using a part of the body. Mark the estimates.
    c. Have each student actually measure the distance with yard sticks. Measurements will not all exactly coincide. Discuss the reasons for the discrepancies. If a tape is available, measure the distance with a tape to further narrow down the discrepancies. This can be done in pairs.

    This activity can be done in meters using 50 meters as the distance and meter sticks to measure.

5. Study the temperature differences in a relatively small area. (within an acre or even a 10 ft. radius) Measure the temperature on the ground surface, in the ground, in the air above the grass, in the direct sunlight, under the tree in the shade, in a hole in a tree or under a large rock. Compare temperatures in direct sunlight to those in the shade. Compare the temperature at the base of a tree, in the lower branches and at the top of the outer branches. Compare the temperatures at two hour intervals.

Discuss the temperature variations and the effects of weather on flora and fauna in the area. Study the kinds of plants that grow in sun and shade. Under what conditions are the greatest variety found? How does temperature affect animal activity?

6. Set up a 50 or 100 meter track. Estimate and then measure with a stop watch or watch with second hand, the amount of time it takes each student to walk or run the distance. Find the average time it takes all students to walk or run the distance. Then determine the number of meters per second each student traveled.

7. Have students measure the circumference of 10 trees of different sizes. Use a tape measure or twine which can then be measured with a ruler or yardstick. Determine the average circumference of the trees measured.

8. Working in pairs, measure one square meter using colored toothpicks and string for marking the area. Inspect the area and compare with each other, the variety of things that can be found in one square meter of ground in a field or in the woods.

Lift and estimate weights of various stones. Then weigh the stones and let the children find out how close their estimates were to the actual weight. Each student could find the sum in ounces or pounds of the weight errors he made and then find his average error by dividing the sum by the number of estimates made.

10. If large ants can be found running along the ground, measure the distance it travels for a short period of time (a minute). Measure the and and find how many body lengths were represented by the distance it traveled in the period of time. Determine how far a student would go if he traveled the same number of body lengths in the same period of time. Find the rate of speed (in miles per hour) that this would represent.

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All You Will Need to Know About Metric

(For Your Everyday Life)

10

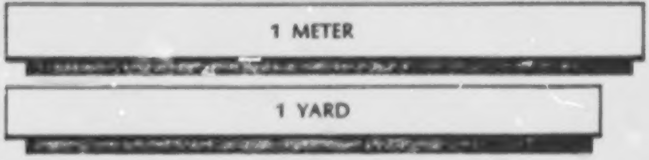
Metric is based on Decimal system

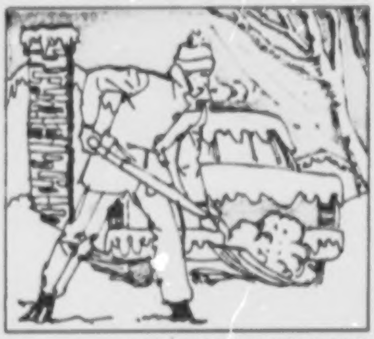
The metric system is simple to learn. For use in your everyday life you will need to know only ten units. You will also need to get used to a few new temperatures. Of course, there are other units which most persons will not need to learn. There are even some metric units with which you are already familiar: those for time and electricity are the same as you use now.

BASIC UNITS

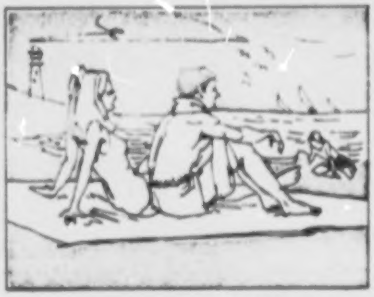
METER:	a little longer than a yard (about 1.1 yards)
LITER:	a little larger than a quart (about 1.06 quarts)
GRAM:	about the weight of a paper clip

(comparative sizes are shown)


1 METER
1 YARD



25 DEGREES FAHRENHEIT



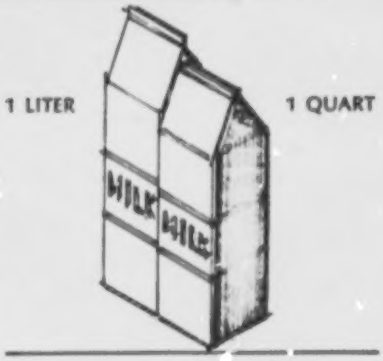
25 DEGREES CELSIUS

COMMON PREFIXES
(to be used with basic units)

Milli:	one-thousandth (0.001)
Centi:	one-hundredth (0.01)
Kilo:	one-thousand times (1000)

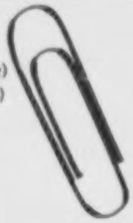
For example:

1000 millimeters = 1 meter
100 centimeters = 1 meter
1000 meters = 1 kilometer


1 LITER
1 QUART
MILK
MILK

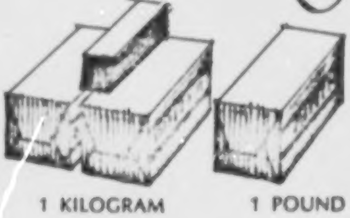
OTHER COMMONLY USED UNITS

Millimeter:	0.001 meter	diameter of paper clip wire
Centimeter:	0.01 meter	width of a paper clip (about 0.4 inch)
Kilometer:	1000 meters	somewhat further than ½ mile (about 0.6 mile)
Kilogram:	1000 grams	a little more than 2 pounds (about 2.2 pounds)
Milliliter:	0.001 liter	five of them make a teaspoon

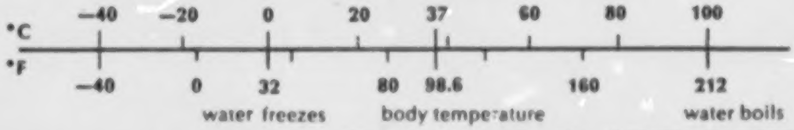


OTHER USEFUL UNITS

Hectare:	about 2½ acres
Tonne:	about one ton


1 KILOGRAM
1 POUND

TEMPERATURE
degrees Celsius are used


°C
−40
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0
20
37
60
80
100
°F
−40
0
32
80
98.6
160
212
water freezes
body temperature
water boils

For more information, write to: Metric Information Office, National Bureau of Standards
Washington, D.C. 20234

METRIC UNITS --- LENGTH, CAPACITY, WEIGHT

In the United States the metric system of measurement is used in Science and industry. Most nations use the metric system as their only official system of measurement. The reason for the popularity of the metric system is its decimal nature. All units in the metric system are derived from a standard unit by either multiplying or dividing the standard unit by a power of ten.

The meter is the standard metric unit of lougth. The original meter was found by dividing a line drawn from the North Pole to the Equator into 10,000,000 parts. Each part was defined as a meter. The table to the right shows the relationship between the metric units of length.

The standard unit of capacity in the metric system is the liter. The basic standard unit of weight in the metric system is the gram. Each of these standard units is divided or multiplied by a power of ten. The following tables show the relationship between the units of metric capacity and the relationship between the units of metric weight.

LENGTH

10 millimeters (mm) = 1 centimeter (cm)
10 centimeters (cm) = 1 decimeter (dm)
10 decimeters (dm) = 1 METER (m)
10 meters (m) = 1 decameter (dkm)
10 decameters (dkm) = 1 hectometer (hm)
10 hectometers (hm) = 1 kilometer (km)

_______ mm = 1 meter?

_______ m = 1 km?

CAPACITY

10 milliliters (ml) = 1 centiliter (cl)
10 centiliters (cl) = 1 deciliter (dl)
10 deciliters (dl) = 1 liter (l)
10 liters (l) = 1 decaliter (dkl)
10 decaliters (dkl) = 1 hectoliter (hl)
10 hectoliters (hl) = 1 kiloliter (kl)

WEIGHT

10 milligrams (mg) = 1 centigram (cg)
10 centigrams (cg) = 1 decigram (dg)
10 decigrams (dg) = 1 GRAM (g)
10 decagrams (dkg) = 1 hectogram (hg)
10 hectograms (hg) = 1 kilogram (kg)

Notice the similarity in the names of the units of the metric system.

1 gram = 10 decigrams = 100 centigrams
1 liter = 10 deciliters = 100 centiliter
1 meter = 10 decimeters = 100 centimeters.

Experiences like those described above will do much to move the metric system of weights and measures from the laboratory and little-used conversion tables to day-to-day use. If generally provided, we soon will have a generation of students able to think and function using a dual system of weights and measures. They will be able to utilize the metric units of the future as well as the English units of the past. Then we can let the latter quietly fade away.

---

[1] Lord Ritchie-Calder. "Conversion to the Metric Sustem." Scientific American. 223:17-25; July 1970.

[2] Congress authorized a study of what would be involved in conversion, in 1968, and this study is now underway.

[3] Davidson, Allan. "Our Feet Are Out of Step". Scinece Year. The World Book Science Annual. Field Enterprises Educational Corporation, Chicago. 1968.P-288.

From
Classroom Ideas. The Science Teacher. Volume 37, Number 8, November, 1970.

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TASK CARDS-----------------METRIC MEASUREMENT

No. 1	EASY MULTIPLICATION	About how many paper clips in a kilogram?
No. 2	YOUR WEIGHT IN BEANS	About how many pinto beans do you weigh? Find your weight in kilograms. Find the number of pinto beans in 10 grams.
No. 3	HAND AREA	Trace around your hand two times on centimeter paper: once with your fingers spread apart and once with your fingers close together. Count the square centimeters and compare the area of each tracing.
No. 4	SHADOW MEASUREMENT	Measure your height and the length of your shadow in centimeters. Measure the height of two other objects and their shadows. Try to find the relationship between the height of an object and its shadow. If you can, determine the height of something by measuring its shadow.
No. 5	TRUNDLE WHEEL	Estimate the length of the room in meters. Measure with the trundle wheel. Estimate two other lengths and measure with the trundle wheel. Express your results in decimeters. Express your results in centimeters.
No. 6	CIRCULAR MEASUREMENT	Find the circumference and diameter of 5 circular objects in centimeters. Make a table.

Diameter	Circumference

Can you find a relationship between the diameter and the circumference?

No. 7	MONEY WISE	Would you rather have a meter long of quarters or a meter high of nickels? Estimate first, then calculate the worth of each.
No. 8	MAKING A WISE CHOICE	Which is worth more: a kilogram of quarters or a kilogram of dimes: About how much more?
No. 9	HOW MANY PACES?	About how many of your paces does it take to walk a kilometer?

The world's smallest man is about 81 centimeters tall. Find that measure in the room.

How can you use the thickness of a dime to find the metric thickness of other things? Measure some things and record your findings.

How can you use the diameter of a nickel in your metric calculations? Measure some things and record your findings.

One of our tallest basketball players is about 216 cm. tall. Can you find a way of demonstrating that measure by using objects in the room? (Chairs, tables, etc.)

Find your own standards for the cm, dm, and m.

cm = ______________________

dm = ______________________

m = ______________________

GRAMS, KILOGRAMS, AND LIKE THAT

These things weigh about

1 gram.........

Use as many of these as you can -

paper clips
thumbtacks
cubes
Unifix cubes
crayons
pencils
nickels
quarters
dimes
•
• Whatever

Record the weights of these different things

NOW TRY THIS -

Find your weight on the scales. ______________kilograms
How many pennies do you weigh? ______________
How many nickels? __________ Dimes? __________ Quarters? __________
Which would you rather have....... your weight in
pennies,
nickels,
dimes, or
quarters?

Compass Fun

Materials: Individual compass
Paper
Pencil
Trail markers

Explain to the whole group of children how to use the compass. (see orange booklet for directions) Use the large compass and let each child have his own compass with which to work. (this step may take quite some time but it is extremely important)

After everyone understands the basic workings of the compass, divide the children into groups of two.

These groups will then proceed to set a trail within a specific area -- in the setting of a trail exactness of the compass setting should be stressed.

The following is an example of part of a trail:

-set compass - 30 N
-walk until you reach a tree with moss growing on its side - look for the marker!!!!
-questions - On which side is the moss growing? Why?

Names______________________________ ________________________________

Starting place:

Set compass:

Walk until:

Questions:

Set compass:

Walk until:

Questions:

Set compass:

Walk until:

Questions:

Set compass:

Walk until:

Questions:

When the time limit you have set has expired -- call the group back together again.

Switch the trails among the pairs of children and let them follow another trail. They must answer the questions asked on the sheet.

If time permits -- sit down and discuss the trails, questions, and any problems that resulted.

Another idea:

Have the group in the morning set the trail and bury (or hide) a treasure (candy, etc.) Then let the afternoon group find it and draw a map of the trail that they followed.

Using a Compass

Needed: Compasses
Giant Compass
Markers (wire hangers work well)

Everyone stands in a row at least an arm's length apart.

Work at learning to read the compass, how to hold it, etc.

Then

Put a marker into the ground between your feet.
Set the compass at 90°. Walk 4 steps, or any given number. (Stress that each time you walk the same size (normal step.)
Set the compass at 180°. Walk 4 steps.
Set the compass at 270°. Walk 4 steps.
Set the compass at 360°. Walk 4 steps. Are you back at your marker?
(We usually try this at least twice.)

Then

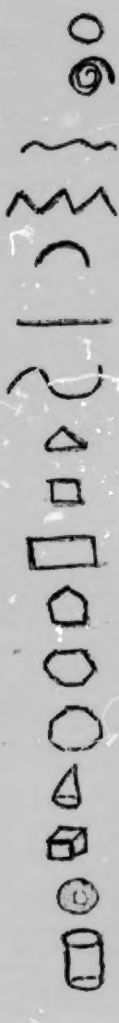
We try an equilateral triangle in the same way 120° 240° 360°
(We do not talk too much about the kind of figure.)
We may try a larger figure and put a marker in at each corner. Then decide what the figure is

or

Give out cards of directions to groups (2 or 3 pupils) to lay out the figures. Then have the entire class decide what the figure is when all groups finish. (Jean has a bundle of these cards.)

GEOMETRIC SHAPES AND LINE VARIATIONS

Locate specimens of natural objects which show one or more of the line variations or other geometric shapes given below:



Circle
Spiral
Wavy line
Zig-zag
Half circle
Straight
Two half circles
triangle
Square
Rectangle
Pentagon
Hexagon
Octagon
Cone
Cube
Sphere
Cylinder

Ways of Learning Social Studies in the Out-of-Doors

Learn local history of Stronghold and Strong family.

Learn history of Indians who lived in this area.

Learn pioneer history -- use log cabin and covered wagons.

Study feudal history -- using castle.

Walk backwards in time -- 100 years to a step -- throughout history and prehistory to time of glaciers in this area.

Invite an "old-timer" to tell it like it used to be.

Tour Guide for Stronghold

Stronghold is a church conference, retreat and camping center owned and operated by the Presbyterian Camping Association of Northern Illinois. The Presbyterian Camping Association represents the churches of Freeport, Monmouth, Ottawa and Peoria Presbyteries. Stronghold contains over four hundred acres of which one portion is wilderness, another wooded portion fronts on the Rock River and a third portion contains beautiful cared for meadow lands and landscaped grounds surrounding a large castle.

Stronghold was acquired from the Walter A. Strong estate in 1963. Walter Strong of Winnetka, publisher at that time of the Chicago Daily News, acquired this property and proceeded to develop it into a summer home for his family in 1930.

Mr. Strong died shortly after the castle was completed but it continued as the summer home of Mrs. Strong and her family until her death in the fall of 1961.

Entrance

This room was used as a gallery by the Strong family with many very lovely paintings and portraits decorating the walls. The paneling is pine which was burned with a blow torch, then rubbed smooth with wire brushes.

To your left and through a short hallway is the Elgin Room. This room has been decorated and furnished by a church school class. The furnishings are new except for the corner chair and love seat. The carving on the wall of Christian symbols was done by four men of the Elgin Church. This room is used for numerous small group meetings.

Through the doorway on the south end of the entrance room and to the left are three bedrooms --

First Floor Bedrooms

The largest of these was Mrs. Strong's bedroom. A bathroom is adjacent to this suite of rooms. There are thirteen bathrooms located in the castle.

Up the short flight of stairs is a circular room with a stone floor and stone benches along the walls.

Guard Room

The family called this the Guard Room. A door leads from this room to the outside under the south archway. The barred door adds to the "guard" room effect. The fireplace is one of the 10 located in the castle.

You will notice above the door a carved beam which contains two dates -- 1632 and 1930. 1632 is when the Strong family came to America from England and 1930 is the year when the castle was completed. This carving like many in the castle was done by members of the Strong family.

Up the short flight of stairs and then up the next short flight of stairs leads to the library.

Library

This unique room is distinguished by its lovely painted ceiling, beautiful wall hangings, many bookcases filled with books, and unusual fireplace. The ceiling was painted by a Russian nobleman Nicholas Kaisaroff, a friend of the Strong family, shortly after the castle

was completed. He received little more than board and room during the year he spent in residence painting this ceiling of the library and the walls on the fourth floor of the tower. The library has proven to be an excellent meeting room for small study groups and committees. (The motto on the ceiling means one must have faith to do one's duty.)
Behind the bookcase opposite the library door is a passageway leading to a secret room. The room was to have beena hidden chapel patterned after French castles during the period when the Roman Catholics were persecuting the Protestants. The chapel has been completed in 1975.

Down the short flight of stairs and straight ahead through the small double doors is a conference room. This was originally used as a game room by the Strongs, but is now used as a general meeting room for groups in the Castle.

Through the small door with the rounded top is the Great Hall.

Great Hall

This room is the showplace of the castle. It has been the scene of many wonderful family parties and events. The furnishings for the most part were left by the Strongs. The organ was one of the early ones developed by Hammond. The chandelier was made here on the property using some second-hand materials, paper mache' light extensions, paper plates beneath the lights and a logging chain to suspend the fixture. There is a place for a second chandelier to hang, but it was never made by the family. (Alcove with river view a favorite spot of Mrs. Stone where she could be apart from Great Hall -- but still in touch.)

The large davenports are down filled and were imported from France by the family. The rug is Oriental. The room is thirty-four feet high, forty feet wide and fifty feet long.

This room is being used as a place for meetings, worship, training and recreation for Sessions, Presbyteries, Women's Associations, Mariners, Synod Committees, Church Officers, Senior High Young People, Couples Clubs, and various other groups.

The tapestry above the fireplace belonged to the Strongs as did the various other tapestries throughout the building.

The small balcony is reached by means of a secret passageway which comes up through the walls of the building.

The large candelabra on the buffet table was forged as a gift for Mrs. Strong here on the property. The ten candle holders represent the 10 grandchildren of Mrs. Strong. On their respective birthdays, she burnt their candle. Some of the other iron work throughout the castle was hand forged on the property.

Leaving the Great Hall you will notice a painting on the wall. It is a copy of a Fresco painted on a wall in Florence, Italy. Cracks and patches have been painted into this picture to make it like the original. It was painted by Mrs. Strong's aunt.

North of the painting through two doorways is the Game Room.

Game Room

This room overlooks the swimming pool and the Rock River. It was used as a sun porch by the Strong family.

Down the hall to the right of the Game Room are located two bedrooms on the left, and two storerooms and a bathroom on the right. At the top of the wooden steps is a door on the left.

Wood Room

The wood for the fireplace in the Great Hall and other fireplaces is stored here. A hay lift was used to hoist the wood up to this level through the double doors opposite the wood room door. This operation is very similar to that of putting hay into a barn loft.

Another bedroom is located down the steps. These steps actually go up and over the north archway.

Back down the hall turning right at the game room, passing by the painting, and turning left is the Tower Stairway.

Tower

The tower is five stories high. Bedrooms are located on the third floor, the next one above. An observation room with visibility in all directions is on the fifth floor. The light fixture hanging in the tower is one of many that were made in the forge located on the grounds.

Third Floor

The large bedroom on this floor was the Master Bedroom in winter because it was warmer than the first floor bedroom.

Fourth Floor

The painting on the walls of the tower room on this floor was done by the Russian artist. The artist painted one story beginning at the doorway to the wooden steps and proceeding clockwise around the room finally ending under the stairs. What is the name of the story? Rumpelstiltskin, of course!

The painting was restored a few years ago by two artists. The artists did not sign their names but left a signature of sorts. The queens brooch and the spider (along side the door) contain the portraits of these two artists. Fourth floor bedroom often used by Anne and her girl friends.

Fifth Floor

The view in all directions and tall trees from this point is very inspiring. Because of a bend in the river the Blackhawk statue is not visible. At one time there was a TV antenna in this room. It was removed so that Stronghold might provide a means for getting away from television, radio, and the "high speed pressure" of modern life to a place where study and reflection might take place.

Dining Room

There are many unique and interesting features if this room. The huge table with its brick center support had to be built in the room. It weighs over a thousand pounds. The high back chairs for this table were kept by the Strong family.

The "hutch" or large cupboard with open shelves displays imported items that were left here by the family. The copperware may be of special interest to those of you who enjoy antiques.

The carving on the beams at the south end of the room was done by the Strong children and grandchildren. The hutch you will notice also contains the dates 1632 and 1930. You will notice a progression of carving on the hutch doors. The designs on the hutch were never completed.

The fireplace is also unique with a Dutch oven. You might also like to note the large soup tureen was made in Italy and was left here by the Strongs.

Grounds

Bunkhouse

The wing to the South contains the bunkhouse which is a self contained living unit. It has beds to sleep 10, a kitchenette, a bathroom and a living room with a large fireplace. This unit has its own furnace so it can be used as a separate facility or in conjunction with one of the other buildings here.

Carriage House

The wing to the north is called the Carriage House. There are seven garages with entrances to the north of the wing. Off the north archway opposite the kitchen door is a door leading to two rooms which were occupied by the maids. The upstairs is used as sleeping quarters for various groups. The entire wing is in the process of being remodeled as a self contained unit which will sleep about 12 people. This will allow us to better serve groups of various sizes.

We hope you have enjoyed your tour. We are looking forward to your next visit to Stronghold. These are your facilities and the staff will be happy to help you in any way they can.

Children

The Strong children ranged in age from three to thirteen when they moved to Stronghold. Walter, Jr. now lives in Wilmette, Robert in Janesville, David is dead, Anne in California and Jonathan on East Coast.

Daily Life in Castle in Peacetime

Porter greeted merchants outside the gate with wares for sale -- visitors of high rank greeted by lord himself. Lesser visitors greeted by lord's 1st squire.

Everyone welcome at a feudal castle -- starved for outside news -- stayed several days.

Feasts and drinking. Minstrels and jugglers -- even lowest peasants on errands for their lords could get a good meal and a bed on the floor rushes at a friendly castle.

Great hall -- beautiful carvings, stained glass windows, rich tapestries -- but stone floors, covered by thick rushes cut in swamps (to keep feet warm and hide bones and scraps thrown to dogs at meals).

Tournaments -- games and sports --
    Checkers and backgammon
    Hunting boar
    Falconry - trained hounds to hunt and bring back birds

Banquets

Spoons, knives, drinking goblets of silver or wood or leather.

Important guests ate from silver plates, rest ate on thick slice of bread called a trencher. These and other scraps gathered in baskets at end of meal and given to the poor.

Bones tossed to dogs.

Much meat -- all kinds of birds, game, beef, lamb, pork, fish, frogs, snails. A few vegetables. Lots of fruit.

Herbs and spices used to disguise taste of spoiled meats.

Peasants ate black bread and vegetable soup -- very little meat.

EXTERMINATION OF THE BUFFALO

Since we have secured two fine buffalo hides for our museum, we feel compelled to write something about the rapid extermination of this animal. The buffalo, at one time, was abundant on the Great Plains of this great land of ours. Very little is known about the animal today. Buffalo meat was the most delectable food, the most complete single source of diet the western part of our country had ever known. Flavorful, tender, juicy, fiberless -- it could be eaten raw, boiled, roasted, broiled, dried, or made into pemmican. More buffalo could be eaten exclusively in one meal, or in a year's time, than any other meat. In no matter what form it was consumed, one's appetite for it never dulled. As long as buffalo were available, the Indians would never eat beef which to them was tasteless and did not smell good. The Indians preferred mule meat to that of the "Wohaws" or "spotted buffalo".

Now, most everyone knows who the "mountain men" were. These were the fur trappers who shared the same tastes as the Indians. Having once tried buffalo meat, they preferred it to any other kind of meat. I might add that one of the pleasures of the fur trapper's life was his recollection of the satisfaction of eating buffalo meat. He described the best things that happened to him, the high points of his life, as "Fat Cow", while the ebb periods of living were known as "Poor Bull". Things easily accomplished were "easy as eatin' buffalo boudins". The greenhorns, newcomers to the west who were employees of the fur brigades and depended on the companies' supplies of food, were contemptously known as "pork eaters". Thus, a large part of the mountain men's vocabulary was inspired by their contact with the buffalo and its part in their diet.

Most world travelers, including European nobility and others who traveled in the west when buffalo were in abundance, proclaimed that the meat was the best they had eaten. One British nobleman, after spending many years in the west, stocked his large estate in England with buffalo so that he might hunt them at any time he desired to have buffalo meat.

There were rituals of procedure to be followed according to custom after making the buffalo kill. The tongue and liver belonged to whoever made the kill as a courtesy in honor of the occasion. He, in turn, might give or share it with others. However, they were his to do with as he pleased. The tongue was removed by cutting under the lower jawbone. Starting at the head of the buffalo (after the hide had been partly removed from the carcass and spread on the ground to receive the choice cuts of meat), the butcher would first remove the "boss" or neck hump. Next would come the "hump rib" for roast or stew meat. Within the hump were ribs or extensions of the vertebrae. The meat would be cut away to expose the ribs, which would be severed with a hatchet or broken with heavy rocks. Along the backbone and under the hide, running from the shoulder blade to the last rib, was the "depuyer", more commonly known as back fat or buffalo bread to the mountain men. Thick as a man's hand next to the backbone, it tapered down to a feather edge over the ribs. Depending on the size and condition of the buffalo, depuyer weighed from ten to twenty-five pounds. In preparation, it was dipped in hot buffalo grease for about thirty seconds to seal or sear it, and then smoked over a fire of sweet wood from ten to twelve hours. Prepared in this manner, depuyer would keep indefinitely. It was sweet, nourishing, and superior to any bread. Depuyer was used in the same manner as bread. It has been said that mountain men would pay as much as one dollar a pound for it. We might add at this time that depuyer, jerky, and pemmican were the prepared foods of the North American Plains Indian as well as of the mountain men. All had definite value, all came from the buffalo.

Under the back fat, or depuyer, lay the inside fat and under that came the "fleece". If the buffalo was in good condition, the layer of fat was sometimes three inches thick. The fleece was the meat extending from the backbone down over the ribs. After the side ribs were chopped away to be set aside with other choice cuts, the liver and boudins were exposed. Quite ofter during a long hard chase, a fat buffalo would become overheated and the liver would granulate. This was considered by the Indians to be a great treat when eaten fresh and raw and sprinkled with gall. According to some historians, the combination was supposed to be slightly intoxicating if sprinkled generously with gall and eaten in quantity. The mountain men had a different recipe than the plains Indian, in that they flavored their liver with gall, gunpowder, and fresh marrow. Boudins were the small intestine containing chyme and were considered the most tender and delicious of all. Some of the descriptions of the eating of boudins by the Indians are most repelling, but the mountain men had a real taste for it when prepared by the Indians. It apparently was a taste thrill that did not repel them. The last select cut of meat to be removed was the tenderloin. When jerky or dried meat was to be made, or if there was a number to be fed, the rear quarters were used. If not, only the marrow bone of the remaining part of the buffalo was used or saved. Now this sounds like a great deal of wasted meat -- and it was. However, the huge herds of buffalo could well stand this amount of killing since it was actually slight in comparison to the great natural losses due to drowning, stampeding over cliffs, or falling prey to the thousands of wolves which preyed upon the vast herds. The days of the buffalo became numbered when the white man began killing only for the hides. Later on, when the Indian found that he could make money by hide hunting, he became just as guilty as the white man.

Without a question the white hide hunter was responsible for the astonishingly rapid extermination of the buffalo. Many of these white men, I might add, were the riff-raff who came out by the hundreds for the easy money to be made from the hides. In killing only for the hides millions of pounds of meat were left to rot on the prairies. There were a million and a half hides shipped from Dodge City alone in one fall hunting period, and that same proportion was shipped from all the other shipping points in the west. What few protests were made against this slaughter were to no avail. This is surely one of the blots on the great history of these United States.

Up in Canada right now there is a small herd of wood buffalo which is managed by the Canadian government. Occasionally special licenses are issued to kill a single wood buffalo to help keep the herd in balance.

THE BLACK HAWK STATUE

From "A Decade of Outdoor Teacher Education", provided by Lorado Taft Field Campus, Northern Illinois University.

Tradition says that the side of the great Indian Statue by Lorado Taft on the east bank of the Rock River north of Oregon is the place where Black Hawk chief of the Sauk and the Fox, used to come to ponder the fate of his people and yearn for the days that once were but were now long past.

Ada Bartlett Taft, in "Lorado Taft--Sculptor and Citizen", says that this spot had a special appeal to Taft, who would stand there and picture "Black Hawk standing there with folded arms as he himself was standing, and he felt that the Indian must not be lost to the land, though the white man had driven him out."

Convinced that he could build a concrete statue honoring Black Hawk, Taft received help from a student, John Prasuh, who had once supervised the construction of concrete bridges and from Leland Summers, an engineer, who explained the necessary engineering. Beginning with sketches eight inches high, Taft showed the Indian wearing a long blanket, standing with folded arms gazing out across the river. The eventual working model was six feet tall.

Beginning the work in 1910, Taft had to contend with the winter weather in working on his statue. Lumber, twisted steel rods, wire netting, burlap were collected during the summer of 1910/ A special derrick was constructed. Special machines were readied. The cement was a gift of the Portland Cement Association which later used the picture of Black Hawk in its advertising. Water for mixing the cement was drawn from the river one hundred twenty-five feet below.

On December 20, 1910, the workmen began pouring the concrete for the statue. The pouring continued night and day for ten days, with up to twenty-eight men working on the project. Once poured, the concrete was left until spring to set.

There was no way of knowing whether or not the project had succeeded until the forms were removed in the spring. Mrs. Taft describes the fateful moment when the mold was removed: "A stout rope had been fastened to the top inside the figure. Mr. Prasuh nimbly and eagerly climbed it; and pushing himself up and out of a hole between the folded arms and the figure's breast, he was able to reach with his chisel a place under the eye and pry off a block of the mold. It was an ominous moment. But look! It is the eye as perfect as in the original clay. Once can imagine the relief and joy with which my husband saw this. If the eye, the most carefully modelled part, was perfectly cast, he was reassured as to the larger planes of the blanket."

The statue was dedicated on July 1, 1911. Among those on the platform with Taft and Frank O. Lowden who presided over the event were Dr. Eastman, an eminent scholar, Laura Cornelius, the daughter of a chief of the Oneida Iroquois, Edgar A. Bancroft, Ella Peattie, and Hamlin Garlin.

Created by Taft, built with the labor of many, the Black Hawk state remains a Northern Illinois landmark and a memorial to the "Eternal Indian."

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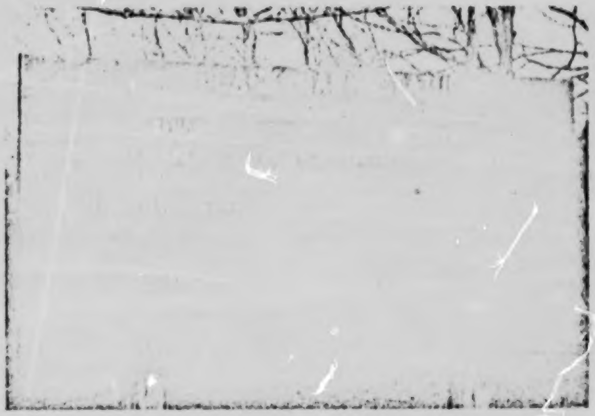
From "A Decade of Outdoor Teacher Education", provided by Lorado Taft Field Campus, Northern Illinois University


The legend at Black Hawk Statue.

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Created by Taft, built with the labor of many, the Black Hawk statue remains a Northern Illinois landmark and a memorial to the "Eternal Indian."

LORADO TAFT

From materials provided by Lorado Taft Field Campus, Northern Illinois University

Lorado Taft, sculptor.

One of the great sculptors of American art made the Oregon area his part-time home for better than a third of a century. Founding spirit of the Eagle's Nest Camp, Lorado Taft created about forty pieces of sculpture during his lifetime. Never content to be just a sculptor, he felt his real calling in life was to promote art, and he traveled extensively giving lectures and aiding students in whom he saw talent. Hamlin Garland, a friend and associate from the Eagle's Nest Camp (and also Taft's brother-in-law) commented in 1923 that he had already given over four thousand lectures in addition to writing numerous articles on the arts.

Born on April 29, 1860, in Elmwood, Illinois, Taft graduated at nineteen from the University of Illinois with the highest marks ever given, to that date, by the University. Leaving the night that he received his master's degree, Taft went to Europe as a sculpture student. After five years of study in Europe he returned to the United States to make his home in Chicago.

In 1893 Taft was asked to superintend all the sculpture for the Chicago World's Fair of that year. He had an opportunity to work with many great artists on this project. Most of his life his sole source of income was from the lectures he gave and the articles he wrote.

Among Taft's sculptures are: Statue of General Ulysses S. Grant, Leavenworth, Kansas, 1889; Medallion of Frances Willard, Northeastern University, Evanston, Ill., 1889; The Sleep of the Flowers and the Awakening of the Flowers, main entrance, Horticultural Building, Columbian Exposition, Chicago, 1893; Defense of the Flag, Jackson, Michigan, 1903; The Blind, University of Illinois, Urbana, 1908; Statue of George Washington, Seattle, Washington, 1908; Paducah, Paducah, Ky., 1908; Black Hawk, 1911; Solitude of the Soul, Art Institute, Chicago, 1911; Columbus Fountain, Washington, D.C., 1912; Frieze around Illinois Building, Pan-American Exposition, San Francisco, Calif., 1915; Soldier's Monument, Oregon, Ill., 1916; James Whitcomb Riley medal, Indianapolis, Ind., 1916; The Fountain of Time, Chicago, 1922; Soldier's and Sailor's Monument, Danville, Ill., 1922; Lincoln, the Young Lawyer, Urbana, Ill., 1927; The Pioneers, Elmwood, Ill., 1928; The Patriots and

([illegible])

the Pioneers, State Capitol, Baton Rouge, La., 1933; Justice, tower of the Federal Building, Century of Progress, Chicago, 1933; Lincoln-Douglas Debate Memorial Tablet, Quincy, Ill., 1936; and his last work, Memorial Statue of President Cherry, Bowling Green, Ky., 1936.

"Soldiers' Monument" by Lorado Taft, on the Ogle County Courthouse Square.

Ways of Learning Language Arts in the Out Of Doors

Write poems, stories, themes inspired by outdoor adventures and by the use of the senses.

Write lyrics to songs.

Make a vocabulary list relating to subjects learned in the out of doors.

Learn to listen creatively.

Keep logs of outdoor experiences and new items learned. Add sketches and snapshots to record outdoor experiences.

Write up research to relate to specimens found in the outdoors. Keep field notes, recording observations.

Write letters of appreciation to places visited, to guides, etc.

Write or create a play about nature experiences.

Write a story from the point of view of an animal, bird, insect.

Listen to poetry relating to outdoors.

Write a newspaper article about Stronghold, the outdoor education program, or some adventure in the outdoors.

Make verbal reports to classroom relating to observations at Stronghold.

Watch an insect, but, or some other living thing for a few minutes. Pretend you are that bug -- what are you thinking?

Choose a rock or flower which reminds you in some way of yourself. Describe why.

Pick a word from nature. Write it down -- make as many rhymes as you can.

Make up a song to "On Top of Old Smoky."

PATHWAY TO VERSE

In just a few minutes you will begin your travels down the Pathway to Verse. Enjoy yourself as you begin to notice things about nature and start to express your feelings about them. Use your whole body -- Look -- Listen -- Smell -- Feel. Read the directions carefully as you arrive at each station.

Station #1 ADJECTIVES

Authors use many descriptive words to make their writing interesting. These two activities will get you started on the Pathway to Verse.

Examine a tree with your eyes closed. Then with your eyes open, study the tree. Here are some words which may describe the tree. Add as many of your own descriptive words as you can:

Rough ____________ ____________ ____________

Tall ____________ ____________ ____________

Leafy ____________ ____________ ____________

Now get down on the ground on your hands and knees and feel the grass. Lie down and roll over. Smell it. Taste it if you like. Now describe the grass:

____________ ____________ ____________ ____________

Station #2 ALLITERATION

At this station, you will use a form called alliteration, which is an initial sound, usually a consonant, repeated in a series of words. Here is an example:

Five flickering fireflies flew fast.

Nature provides many examples of alliteration. Look around you and find your own examples. Write two of your own.

____

____

As you go on to Station #3, remember to observe objects in nature along the way. Relax and enjoy your walk. What living creatures did you see?

Station 3 COUPLET

A couplet is two lines of verse. The last word in both lines rhyme. Here are two couplets:

The tree so tall
Makes me feel small

I just heard
A singing bird

Now --

It is your tuwn to write a couplet. Write at least one, but as many more as you like.

Station #4 TRIPLET

A triplet is much like a couplet, except that a triplet has three lines. The last words in each of the three lines rhyme. An example of a triplet:

The worm so round
Made not one sound
As he crossed the ground

Look around you -- there are many things to be noticed. Use a triplet to tell about something you see:

Station #5 LIMERICK

READ CAREFULLY! A limerick uses a couplet and a triplet. The triplet is on lines 1, 2, and 5; the couplet is on lines 3 and 4.

In the tree sits an owl
On his face is a scowl
He spies a mouse
Leaving her house
Then he's on the prowl

Look around. Take your time. Write your limerick below:

Station #6 HAIKU

You should enjoy this form of verse. It is used by the Japanese to describe things in nature. Haiku is three lines long. It does not rhyme. Haiku is based on the number of syllables in each line. Here is all you need to remember:

The first line has five (5) syllables	Soft wings fluttering (5)
The second line has seven (7) syllables	Bright colors flying through air (7)
The third line has five (5) syllables	Lovely butterfly (5)

Look around. Write your Haiku. Remember 5-7-5 syllables.

____

____

____

You have followed the Pathway to Verse and have learned several different forms of verse. Which form did you like best?________________________

Using the form that you like best, describe any object in nature that you can observe right now. If you like, illustrate this final verse with a drawing:

Hasn't this been fun? Why not take the PATHWAY TO VERSE some other time and find new ways to express your feeling about NATURE.

Sensitivity and Language Experiences

I. Using senses

A. Hearing

1. Take silent walk -- tell what heard

B. Sight

1. Walk with ears covered — tell what seen

2. Walk blindfolded with partner

a. Partner gives directions

b. Partner silent, acting as a guide dog

3. All blindfolded, walk with hand on shoulder of person ahead

4. Tell how one felt when doing #2 and 3

C. Taste

1. Taste hickory nut and acorn

D. Smell

1. Walnut

2. Some dry dirt and some dirt from near pond

E. Touch

1. Feel different objects, living and dead, and describe using as many different adjectives as possible

2. Tape thumbs and walk uphill on all fours. Try to pick up on object with one hand. Then tell how the thumbs help

II. Language experiences

A. "Frame" picture description

(Fold sheet of paper in half. Tear out frame, saving middle section and frame. Go off individually and place frame on an object or site. Write description of what is seen. Use center torn from frame to write on. Read to group and see if others can identify object or place.

B. Appreciation

1. Listen to selection of poems read by teacher

2. Draw a sketch to illustrate a part of one poem

Creative Drama

Linda Meier

Notes: "Creative" may have to be explained to the children (e.g. I give a problem and you act it out in your way.) Use concrete or abstract images. Ask the children for images as you proceed, too. "Find a way to...."

1. Have children each find their own "space." They stay in that "bubble" unless you say to carry it with them. Explore space.

2. Warm up with locomotor and non-locomotor movements: run, walk, skip, hop, jump, bend, stretch. Vary with speed, direction, level, shape. These can be done 1) in their own space 2) while carrying their space with them.

3. Images to initiate movement. Be like: clouds, lightning, planets, rain, rainbow, stars, thunder, growth, crawling, hopping, jumping, flying things and creatures. Let them build a nature story to act out (short). Ask what in nature "hops?" Be that, etc.
   Go: cross a stream, explore moon, walk on a cloud, set up camp, spin web, etc.
   Feel: cool, quiet, strong and act out these feelings. Children are "full" of ideas once they've been set free.

After introduction and rules "I expect" we would hike, talk, sing and do some of the activities listed below. I usually alternate quiet activity and more active ones.

1. Hike and stop. List things you saw or list things heard on way.
2. Read a nature poem to them in a good spot.
3. Creative writing idea: The animal most like my personality is........Why?......
4. The frame activity described by A.D. Olejnik.
5. Build-a-story -- one person starts a line, each person adds to it.
6. Mars paper.
7. Act vocabulary (nature) words out.
8. "A word (nature) make many" game.
9. Pantomime or charade.
10. Act our daily activity of a certain animal.
11. Clouds - lie down, look at formations, use imagination "What do you see?" Make up a tale about it.
2. Part of *Pathway to Verse*.

1. Describe the type of sounds you hear during a quiet time.

2. Do on your own -- each person find an object and think of as many words as you can to describe it.

3. Find a different object and make a list of as many words as you can that rhyme.

4. Write a description of one object you see. Read it to the group for them to guess the object.

5. Write a sentence about an object using the following forms --

a.	Declarative	a statement
b.	Interrogative	a question
c.	Imperative	a command
d.	Exclamatory	surprise or excitement

6. Close your eyes and have your partner hand you objects to describe orally.

7. Find and record an object that fits the following description:

    1. slick
    2. hard
    3. rough
    4. soft
    5. slimy
    6. velvety
    7. ribbed
    8. small
    9. large
    10. oval
    11. round
    12. oblong
    13. smooth edged
    14. rough edged
    15. triangular
    16. pointed
    17. spongy
    18. solid
    19. hollow
    20. cold
    21. clammy

1. To develop group unity and rapport with students, tell them a wild story about the "the days when I was a pioneer." This idea can be expanded as the session progresses.

2. Descriptive words and phrases: Have each child examine objects in a series -- the pond, an oak tree, moss, a pine tree, and grapes on the vine (located on fence around swimming pool). Students are to pretend that they are scientists from Mars who have never seen these objects. It is their job to describe each item over an imaginary telephone. The "expert" (teacher" on the other end of the phone will identify the item only after each child offers a descriptive word or phrase. Note: The investigations should deal with one of the five senses. Warn children not to taste dangerous items!

3. Write or speak about the question --what plant or animal reminds me most of myself?

4. Creative Dramatics

   A. Choose a "topic" in nature. Develop a skit about that topic. Try to make it so good that everyone can guess it!

   B. Pair off (no more than 3 in a group). Lie on the ground, and form a letter of the alphabet. When the teacher guesses your letter, make another one. See how many you can form.

   Walk away from the group. They should "create" a word containing as many letters as there are pairs of students. Return, and discover their message!

   C. Divide group (boys/girls). They should select a machine that is familiar to all. Act out the action of the machine so that the other students know what the machine is.

Language Arts Activities

1. Vocabulary Building

A. Describe the type of sounds heard (ex. rustle, buzz, rumble, etc.)

B. Use adjectives -- list things that are soft, rough, sharp, etc.

C. Find an object and think of as many words as they can to describe it.

D. Have each child find an object and make a list of as many words as he can that rhyme. Compare the lists to see who has the longest.

E. Give child chart with colors -- red, orange, yellow, green, blue, violet -- find as many items as can and put them in correct column. Compare list to see who has longest under each column.

2. Phonics

A. List as many outdoor objects beginning or ending with letters of alphabet. Compare lists.

B. Word safari -- take hike and give seen objects that fill teacher's objects. (ō, ā, ĕ, cl, fl, etc.)

3. Senses

A. Discuss how we learn by reading. We can "read" the "book of outdoors" by using our senses. Each group jots down their observations under the following headings --

We saw...
We heard...
We felt...
We smelled...
We tasted...(tasting should be under teacher supervision)

Share the lists.

4. Interviewing

A. Each student pretends he is something outdoors (animal, tree, bird, flower, rock). Selected reporters attempt to learn the life history of the object or animal, what it has observed going on around it, and changes it expects in the future.

5. Dramatization

A. Dramatize acitivites of animals and movements of trees or plants in the wind. Have children guess what is being dramatized. Emphasize that before one can interpret something in dramatics, he must first observe and analyze it.

6. Organizing and Presenting Information

A. Divide large group into smaller groups. Each group chooses a category (birds, animals, trees, etc.) Each person in the group chooses something in that category (woodpecker, squirrel, maple, etc.) Other groups try to guess (by asking questions that can be answered yes or no) what individuals in other group are. A no answer gives turn to ask questions to another group. Any group that has to answer "we don't know" instead of yes or no to more than three questions must tell name of its object. Object is to guess each individual's identity in a group.

A Letter to Mars

Pretend you have landed here by space ship. Pick an object and write a letter back to fellow-Martian describing it. You should use all five senses, if possible, BUT you cannot call anything by the names or terms we usually call them in English. Will we be able to guess the object you picked?

Questions That Lead to Creative Writing

If the world had only one color, which would you want? Why?

If you lived in a world with no night, when would you choose to sleep? Why?

If you could live with only one other person, what kind of person would you choose? Why?

If you could take 3 things to the moon, what would you take? Why? What would you give up if you could take only 2?

If you could switch places with anyone in the world, who would you switch with? Why?

If you lived in a world where you could learn one new thing each day, what would you choose for today?

Specific Activity: Awareness Hike

Objectives: The students participating in the awareness hike will:

a. be able to list at least two examples of the interrelationships between living things.
b. be able to think of at least two examples of how the (biotic) communities at Bluffville are different. (prairie, forest, marsh, stream).
c. be able to identify several wildflowers and trees.
d. be able to identify two soil conservation practices.
e. be able to describe the natural history and pioneer use of several plants in the area.
f. increase their sensitivity (**sight**, **sound**, **feel**ing) to the natural environment.
g. discover homes and habitats of certain organisms.
h. be able to point out where the stream has changed position and describe the succession that is taking place.

Learning Activity

The ECO-leader or teacher will lead a discovery hike around the trails at Bluffville with stops at prairie, forest, marsh, and stream communities to study and discover the interrelationships of the communities present at Bluffville. Breaking the class into smaller study groups will enhance the learning situation.

Evaluation

The student will be able to cite examples of the objectives during discussion session following the hike.

Specific Activity: **Language Arts**

Objective: Students after completing the language arts activity will demonstrate their ability to perform one or more of the language art skills using the Bluffville environment as a subject source.

Learning Activity

Materials needed: Pencils, paper, clipboards. Copies of poem "September".

Suggested field work:

Alliteration

Alliteration is the repeating of the same beginning letter. You name something and then think of a word beginning with the same letter to describe it. For example: bee, bumble bee Now try to think of two words to describe it. big bumble bee. See how many you can find. An example is big, black, buzzing, bungling, bumping, bumble bee.

Similes

Similes are comparisons using like or as. An example would be: The wind whining like a puppy.

This is a good time to use what you have learned when you closed your eyes and listened or when you smelled something. Use any of your senses.

Poetry study

You have a copy of Helen Hunt Jackson's poem, September. (See next page) Listen while I read it to you. As we go along underline the things the author mentions as coming in September. Have any of you seen any of these things today? Where? Have you seen rose hips or haws? They belong to the same family as apples. When you go back to your classroom you may want to bring some of these things and make a table display to illustrate the poem. Another thing you can do is find pictures to illustrate it and make a bulletin board.

Cinquain

The cinquain is a five lined poem used by the Italians. It is very simple to write.

First line: Use one word giving a title.
Second line: Use two words describing the title.
Third line: Use three words showing action.
Fourth line: Use four words showing a feeling about the action.
Fifth line: Use one word that is a synonym for the title.
(Example on next page.)

Ways to Learn Natural Sciences in the Out of Doors

Learn to recognize on Nature Rambles: Trees, Wild Flowers, Animals, Birds, Insects, Fungus, Lichen, Animal Tracks, Habitats

Learn of the interdependence of all beings in Nature.

Learn good conservation practices.

Visit the Tree Farm.

Take nature scavenger hunts.

Play nature games.

Make weather observations.

Take hand lens hikes.

Take underneath hikes.

Take square foot hikes.

Tap maple trees -- make syrup.

Take star hikes and night sounds hikes.

Explore streams and ponds.

Collect and mount specimens -- Restrict the number and size of specimens each student can take home. Collect specimens only away from the beaten paths.

Earth Science Projects

Learn land forms.

Learn of the causes, effects, and remains of the glacial ages.

Learn to recognize rocks, minerals and fossils.

Take soil samples and learn their causes and effects.

Take rain hikes.

Study soil cuts.

Estimate time by the sun.

Make weather observations and predictions.

Memory Aids for Tree Identification

E is for Evergreen

P is for Pine -- P is for Packages: Needles come in Packages of 2,3, or 5 on Pines.

S is for Spruce -- S is for Square: Spruce needles are Square, they grow Singly and Spiral around the twig.

F is for Fir -- F is for Flat: Fir needles are Flat, (twigs very smooth).

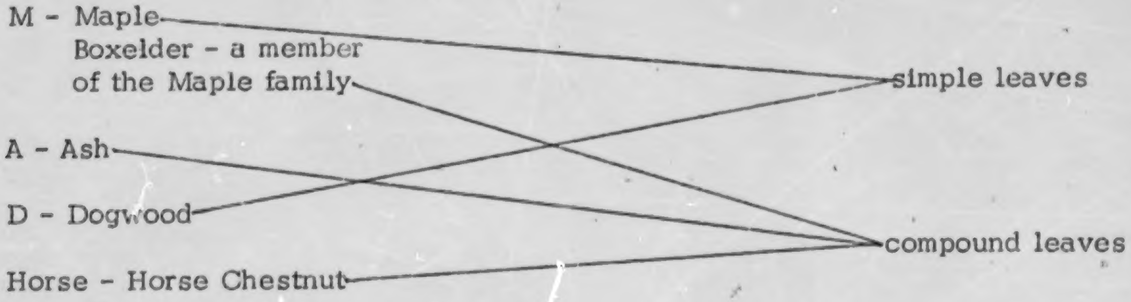
C is for Cedar -- C is for Chain: Cedar leaves look like Chains. White Cedar needles are snub-nosed, like bullets. Red Cedar needles are pointed at the ends, like arrows (see Red Oak and White Oak legend below).

H is for Hemlock -- also for Hem rhyming with Stem: Hemlock needles are flat like the Fir, but have tiny Stems.

L is for Larch -- Larches lose Leaves (needles) in winter. They are not a true evergreen, because they are deciduous. The other name for American Larch is Tamarack.

Trees with Opposite Branches, Twigs and Leaves

The memory aid is Mad Horse.



How to Tell a White Oak Leaf From a Red Oak (also Black Oak Family)

When the White man came to America, he found the Red man already here. When they fought for possession of the country, the White man used Rounded, Snub-nosed bullets like the rounded, snub-nosed lobes of the White Oak, the Red man used Sharp, Pointed arrows, like th sharp points of the lobes of the Red Oak.

Square Foot Field Trip

Classify everything you find in your square foot. Search carefully, using a pick. Uncover one layer at a time. When finished, replace everything as you found it. Fill in any holes you have dug very carefully.

You may classify your findings under the following headings -- add any more classifications of your own that you choose:

Animal	Vegetable	Mineral

Living	Non-Living

Natural	Man-Made

Color	Odor	Texture

Use all of your senses!

Specific Activity: **Field Study of a Rotting Log**

Objectives

Students will demonstrate their knowledge of log decomposition by being able to identify or explain.

- a. three forces of nature that help to decompose
- b. three organisms that help to decompose
- c. three ways plants help to decompose
- d. the end product of decomposition

Learning Activity

Materials needed: rotting log. No other material is necessary. Magnifying glasses, insect and fungi guides are helpful.

General survey before detailed study

Old log or newly fallen tree? How can you tell?

What happens when a tree falls? What forces of nature go to work on dead tree?

Where is this tree located? Does its location have anything to do with the rate of decay?

- I. Forces of nature
  - A. Weather
    - 1. Rainfall
    - 2. Frost
  - B. Forest Cover
    - 1. How effects decay
    - 2. Compare with log in more open area.
    - 3. Compare with log in a swampy area.
- II. Insects
  - A. Kinds
  - B. What they do
  - C. Examples
  - D. Why more in some places than in others?
- III. Plants
  - A. Lichens
  - B. Fungi
  - C. Small plants

Specific Activity: Field Study of a Rotting Log (cont.)

Learning Activity (cont.)

IV. Work of plants
    A. Root systems
    B. Acids
    C. Moisture preservers
    D. Plant succession
V. Final decay
    A. Final result
    B. Good of this
VI. Reasons for leaving the log undisturbed
    A. Enriches forest
    B. Other people may want to study it

Evaluation

Teacher observation of learning experience. Student drawing of organisms that decompose, or teacher-made quiz.

Stump Study

How long ago do you think the tree was cut?______________________________

How old was the tree at that time?______________________________

Was the tree's growth the same each year?______________________________

Discuss:

Are there signs of injury?________What?______________________________

____

What are signs of decay?______________________________

What is the diameter of the tree at the cut?______________________________

What is its circumference?______________________________

Use the rest of the paper to make a rubbing.

Specific Activity: Seed Dispersal

Objective:

Students will demonstrate their knowledge of how seeds are spread by identifying methods, gathering examples, and classifying the examples on the seed chart.

Learning Activity

1. Discuss with the class what seeds are and how they are spread. Emphasize that man is the biggest carrier of seeds and this can be either good or bad for the environment.
2. Hunt for different types of seeds and figure out how they are spread.
3. Have each child find one seed to represent each method on the seed dispersal sheet.
4. Complete the assignment by placing each seed under the proper classification on the seed dispersal chart.

Methods of dispersal:

	Examples
I. Wind-borne seeds	
A. Winged seeds	maple
B. Seeds with parachutes	dandelion
C. Wind scattered	ragweed
II. Hitch-hikers	
A. Sticky seeds	wild radish
B. Burs	burduck, cocklebur
III. Animal carriers	
A. Animals that bury seeds	squirrels
B. Animals that cache seeds	chipmunks
C. Man	
1. Discarding seeds	
2. Unintential carrying	
3. Intentional planting	
IV. Seeds that pop from plants (touch-me-not)	
V. Water-borne seeds	lotus, walnut

Follow Up - Discuss back in class man's interference with the natural cycles of seed dispersal. What does man do to control unwanted plants. Can some methods be harmful to the environment. Are there alternatives?

Evaluation

Students will complete the seed dispersal classification sheet.

SEED DISPERSAL

Wind-borne Seeds			Others
Winged Seeds	Seeds with Parachutes	Wind Scattered	Hitch Hikers
Birds	Animals - People	Pop from Plants	Water

ACTIVITY: To set up an environment which displays the earthworm's activity in the soil.

DISCIPLINE AREA: Science

PURPOSE:

1. To help students learn about the earthworm and the contribution it makes to man through life in the soil.

OBJECTIVES:

The student will be able to write a paragraph telling how the earthworm plays an important role in building our soil.

LEARNING ACTIVITY:

Construct an earthworm farm using:

1. a transparent container and covering 3 sides with any dark material to create a realistic earthworm environment.
2. Place in this container the following layers of material:
   - a) coarse material (pebbles, rocks)
   - b) sandy clay or a sandy clay mixture
   - c) silt
   - d) semi-decayed matter (humus)
   - e) newly fallen twigs, leaves
   - f) a number of earthworms suitable to volume of container.
3. Maintain an atmosphere suitable to the preservation of the earthworm's environment.
4. In a separate container establish a control by developing a similar environment following No. 2 steps a-e (leaving out the earthworms)

* If the container is of suitable size, it may be divided into two parts - one being the control and the other the actual earthworm farm.

BLUFFVILLE
FOLLOW-UP ACTIVITY

ACTIVITY: Comparing the area and perimeter of Bluffville to a school site.

DISCIPLINE AREA: Mathematics

PURPOSE: To help students better understand the concepts of area and perimeter.

OBJECTIVES: The students will be able to:

1. distinquish between the concepts of area and perimeter by calculating the area and perimeter of the school site.

LEARNING ACTIVITY:

1. The teacher will supply a model containing the dimensions of the Bluffville Site (See page 36) The students will then calculate the area and perimeter of this region.
2. Using a tape measure, a yardstick, a meter stick, a land measuring wheel, pacing or any other device suitable for measuring, the students will find the dimensions of their school site.
3. The students will compute the area and perimeter of the school site they measured as compared to the area and perimeter of the Bluffville Site.

BLUFFVILLE TEST OF KNOWLEDGE

1-6 Place the letter of the correct answer in the blank.

1. The only organisms that can use the sun's energy to make food are _____

a. men.	c. fish.
b. mushrooms.	d. green plants

2. When walking on a hilly trail, you may prevent erosion by _____

   a. zigzaging.
   b. turning around and going back.
   c. walking straight up or down.
   d. running.

3. When a tree falls it _____

   a. turns to rock.
   b. rots back to soil.
   c. just lies there.
   d. turns to gas.

4. The greatest single scatterer of seed is _____

   a. man.
   b. water.
   c. wind.
   d. animals.

5. A stream _____

   a. never leaves its banks.
   b. never changes direction.
   c. follows the path of least resistance.
   d. always flows straight.

6. Stream banks erode fastest when _____

   a. the banks are grassed.
   b. the banks are bare.
   c. banks gradually slope.
   d. banks are rock covered.

7. Complete the following food chain:
(1 pt)
Clover----->________________----->________________.

8. Name three forces of nature that help decompose.
(3 pt)
a. ______________________
b. ______________________
c. ______________________

FIELD EXPERIENCE III

MAN AND THE ELEMENTS

Place: Camp Benson, Mt. Carroll

Purpose: To study the forces of change in this unique geological area.

Transportation: A bus will be needed to and from. See appendix for bus trip activities.

Material and Equipment: All material and equipment supplied by the ECO-Center

Children will need a sack lunch or other food to cook. If the class is going to bake apples, each child will need an apple.

Proper Dress: This experience takes place in late March and early April. Children should dress warmly as the weather is likely to be unstable. Each child should have boots, gloves, and a covering for the head. There is a lodge to get in out of the weather.

Assistance: An ECO-Center staff member will assist the teacher on the field trip.

Cancellation: The weather at this time of the year can be unstable. To reschedule a date call the Center (259-3282) after 8:00 AM or the director before this time.

Pre-Trip Planning: Follow tips under Planning and Conducting Field Trips. It is possible to do some outdoor cooking if desired.

The Camp Benson area has many geological features which are unique to this area and a study of these features is a major part of this experience. A lesson has been developed for presentation, dealing with the geological history of this area. The filmstrip from Rock to Forest would also be an excellent pre-trip study.

CLASSROOM PRESENTATION

Purpose: To acquaint the student with the area prior to the experience.

Camp Benson is owned by the Sterling YMCA and is used as a summer camp. The area was owned for many years by Ben Smith and was run as a private park. The main attraction was a cave, part natural and part drilled by lead prospectors. This cave was reached by crossing a suspension bridge, and was lighted by a private electric system.

The cave is still there but is not accessible because of the deep water at its mouth. The bridge has been gone for years. We will not be able to go into the cave.

During the depression of the 1930's, attendance fell off when eople had no money and the government established free parks. The area was then used as a CCC camp for inner-city unemployed boys. The remains of some of the old installations are still there. The property was then bought and the purchaser started to build, but for some reason the building was not completed until the YMCA bought it and finished the building as a lodge. The only other buildings are bunk houses.

This area is unique, that is, very unusual, for this part of the country. It is at the edge of a region known as the driftless area, land that was never covered by glaciers. The uniqueness is a product of a long history of changes in the earth's surface.

The earth is made of rock. There are three classes of these rocks, igneous, sedimentary, and metamorphic. All rocks were originally igneous. This rock is volcanic and was once molten. After it hardened, weather began to work on it. Winds and water, freezing and thawing, gradually broke it down and carried it away and deposited it somewhere else.

This part of the United States was covered with shallow seas. The streams carried the broken-up igneous rock into the seas and filled them in. Sometimes the land would rise and the bottom would be dry land. Erosion would start immediately. Then the land would sink again, the seas would come in, and the streams would deposit another layer of silt. The shallow seas remained for a long period of time. Eventually many layers of silt were laid down on the bottom of the shallow seas. The weight of the layers on top would pa pack the ones below into rock. The newly formed land tilted and folded, changes taking place within the earth and these showed up as changes in the layers of rocks.

How do we know that the rocks were once in the sea? We can tell by the fossils. These are of sea animals much like those found in shallow seas today.

If the rocks have enough pressure and heat they are changed again to metamorphic rocks.

(Show transparencies #2 of rock layers.) Transparencies follow Page 61.

This went on for millions of years until the layers of sedimentary rock were thousands of feet thick. It has been more millions of years since the last time the sea covered this area. In the Camp Benson area the top rock layers have been worn away to the Galena dolomite. This is a very thick layer which can be seen in the deep canyons of the park. It is identified by a fossil, the receptaculites, which we will see when we go on this field trip.

After these millions of years the climate changed. (Show transparency #3 of North America). For thousands of years snow fell and piled up until it turned to ice. Still it snowed and the weight became greater. Finally the ice began to move. This moving ice is called a glacier. There were two great centers of glaciers both in Canada, one east and one west of what is now Hudson Bay. The ice moved very slowly, often only a few feet a year, but it covered everything in its path. Boulders, sand, and gravel were frozen into the layer of the glaciers and this acted as sandpaper, leveling off the hills, filling valleys, scraping the rocky ledges clean.

Slowly the glaciers moved south. (Show transparency #4, fig. 5 and 6). Four times the glaciers moved south and then melted back. The first glacier, the Nebraskan, sent a tongue of ice over what are now Minnesota and Iowa south to northern Missouri. It covered parts of Wisconsin, Illinois, North and South Dakota and Nebraska. For some reason there was an area (shown in dots) that was untouched. The next, or Kansan, glacier covered much of the middle west but again missed the small area shown in dots. The third (transparency #5, Fig. 7 and 8), Illinoian, reached almost to the southern tip of Illinois but missed the same area. The last, or Wisconsin, again missed the same spot.

This unglaciated region is known as "the driftless area". While the land all around it was leveled off to rolling hills and gentle valleys this was left with steep hills and deep valleys. When the last glacier melted great rivers were formed, and these rushed through the driftless area cutting the valleys deeper and leaving deposits of rocks and grave. While the glaciers scraped away the plants of the land it covered, these same plants lived on in the driftless area. Today we find plants here that are not found anywhere in the area covered by glaciers. We shall identify a few of these plants.

(Profile transparency #6)

This transparency shows how the Galena dolomite is folded so that it tilts up in the Camp Benson area. Notice how the top layers have been eroded away so the dolomite is exposed in the canyons.

(Transparency #7 of Camp Benson)

Here we see how the Waukarausa River has cut a deep, crooked canyon through the park. The normal way for the river to have drained was to the south, but it is believed that a huge ice dam blocked the way. The river had to cut a channel through the rocks and drain west to Plum River.

In this camp we will study the rock formations and possibly find a few fossils. We will see some plants and trees that are uncommon and usually found further north. We will learn to use a compass to find our way in the woods, and we will learn to make field measurements. We will see evidence of many kinds of wild animals which live here. Some of you may find fossils which have been carried in by streams. The transparencies #8 & #9 will show you the kinds of fossils most commonly found. Receptaculities is a fossil generally only found in Galena dolomite.

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DIXON, ILL. 61021
PHONE: (815) 284-[illegible]

Animal Tracks

TRACKS are often the only evidence of the presence of wild animals. Such tracks can provide information about their abundance, range, and habits.

The majority of such animals are most active during twilight hours or at night, a principal reason why they are not seen more often.

To "know" an animal is to know the location of his home, his food, his enemies, and his habits.

Tracks are a record of activity and by close study an observer can become intimately acquainted with an animal without ever having seen it.

Tracks of many animals are similar in appearance; for instance, the tracks of dogs, foxes, coyotes and wolves. It is a help in the identification of such tracks to know which of these animals frequent the locality in which the tracks are found.

Tracks are best observed after rains, as in mud along stream banks, or following light falls of wet snow.

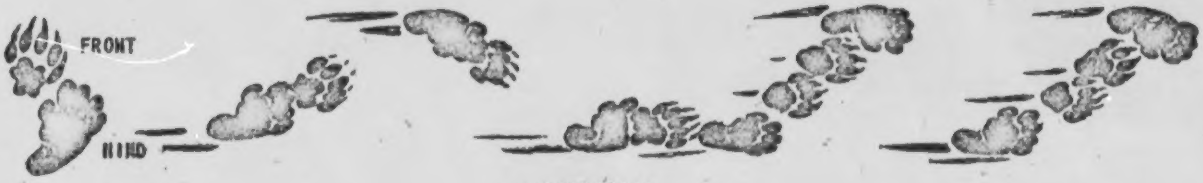
Tracks shown on the following pages are more perfect than are usually found under natural conditions.

Schafer

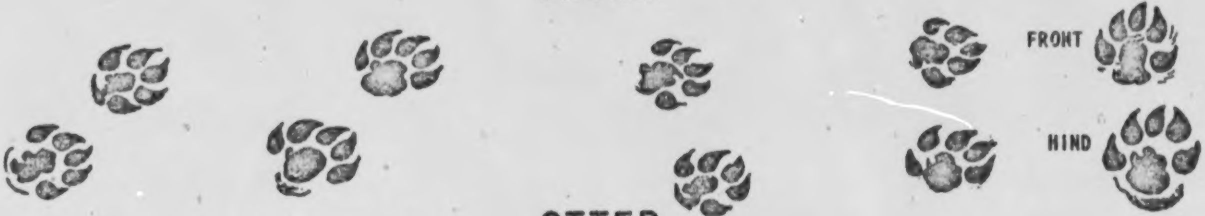
SHORT-TAILED SHREW

WEASEL

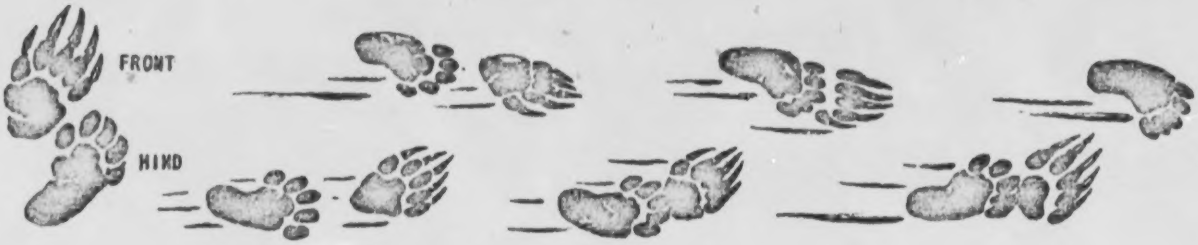
MINK



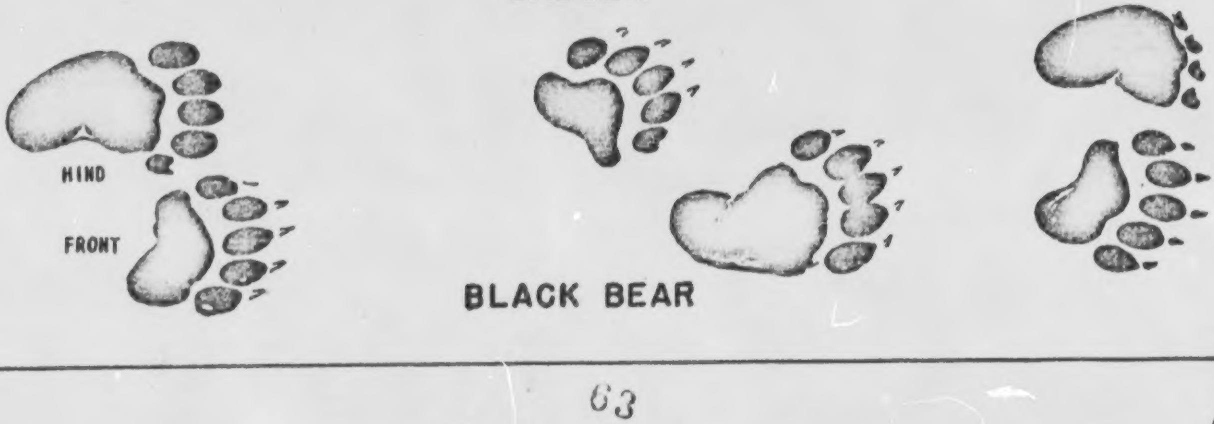
SKUNK



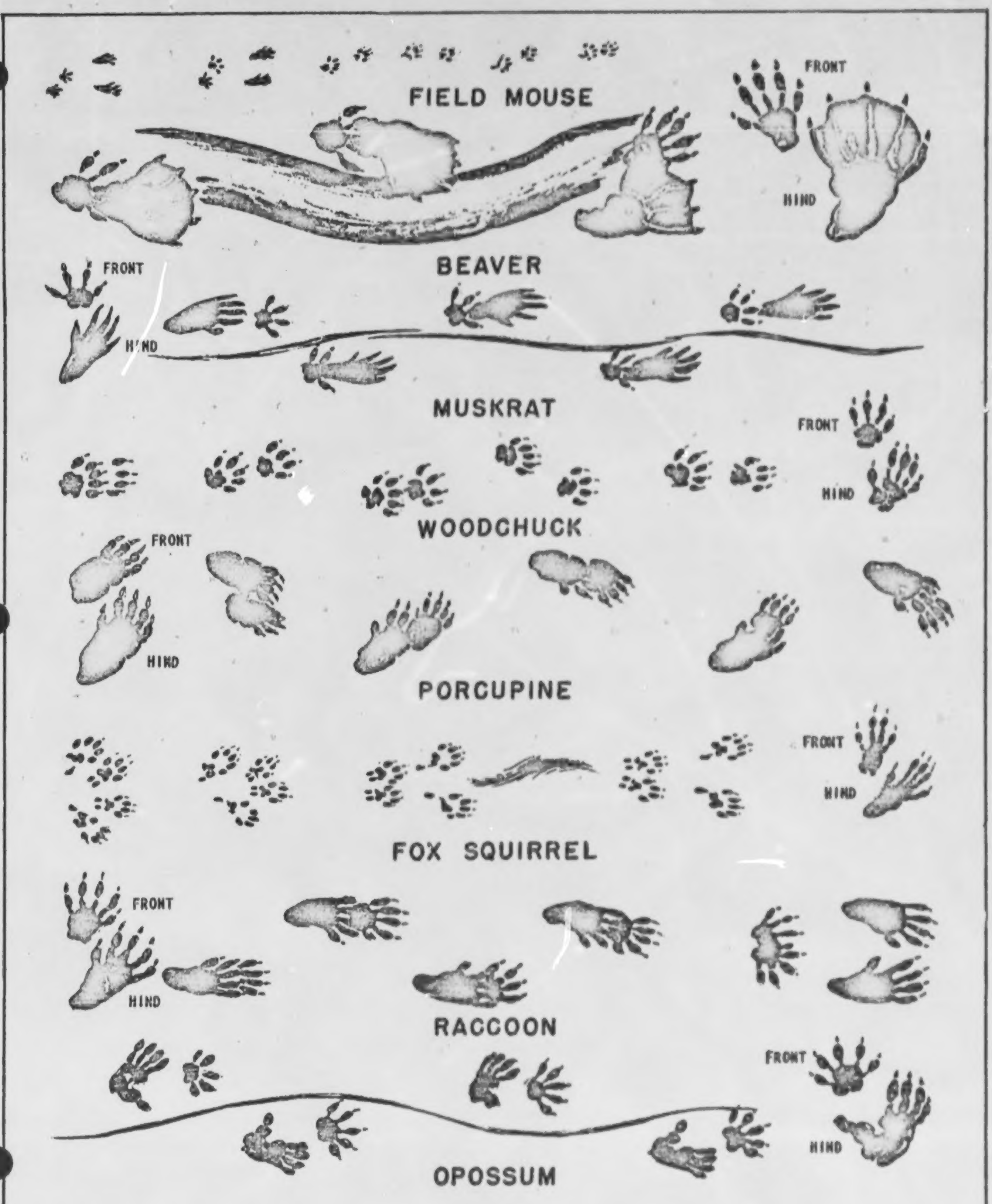
OTTER



BADGER



BLACK BEAR


FIELD MOUSE
FRONT
HIND
BEAVER
FRONT
HIND
MUSKRAT
FRONT
HIND
WOODCHUCK
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PORCUPINE
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FOX SQUIRREL
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RACCOON
FRONT
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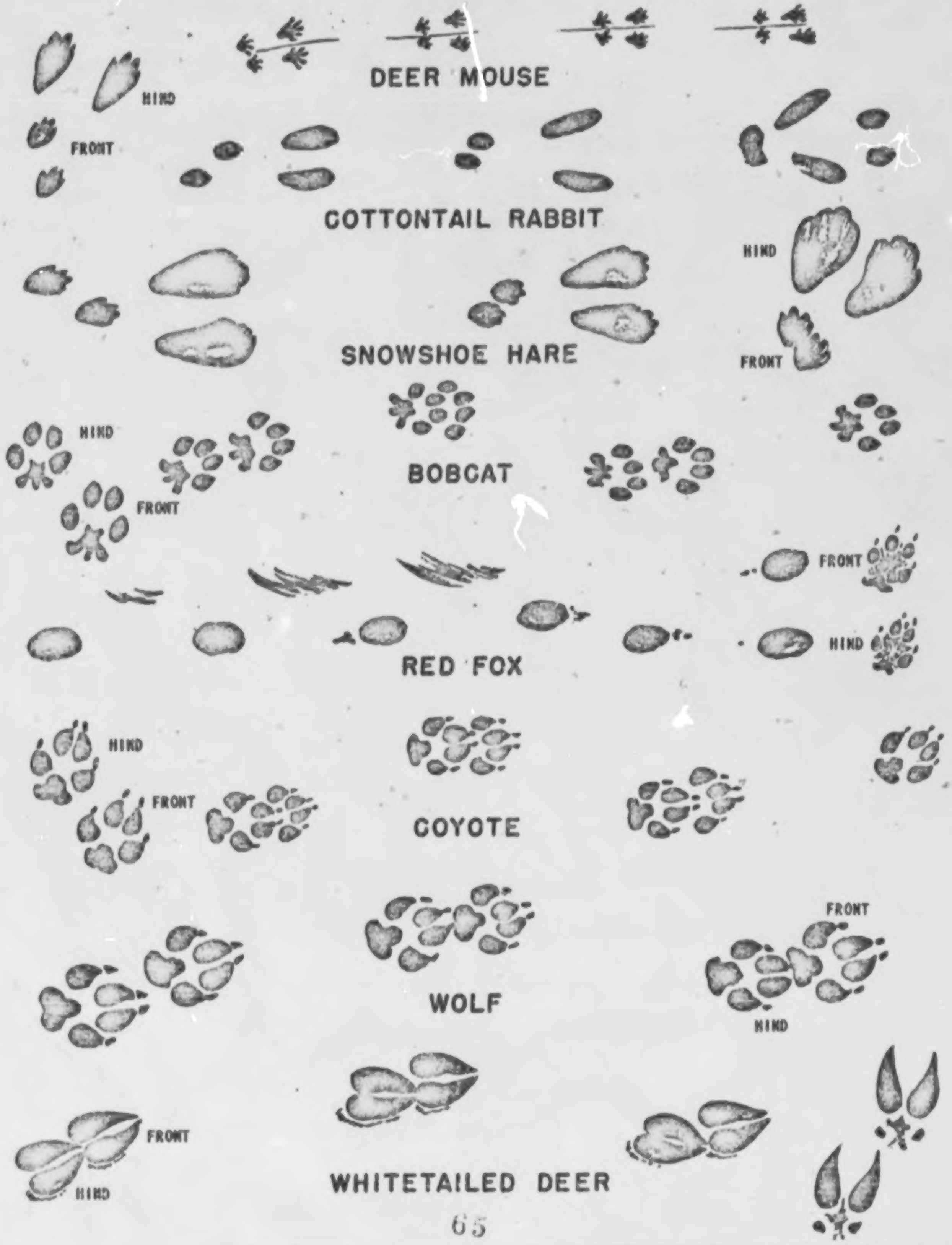
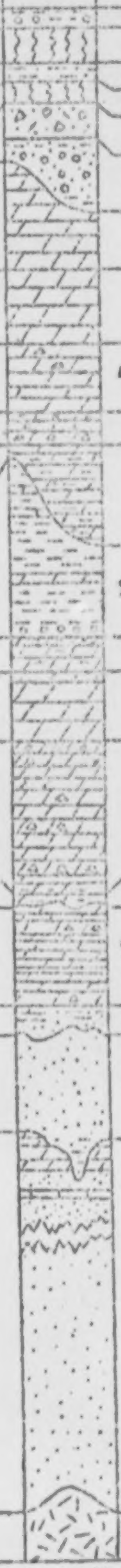
OPOSSUM


HIND
FRONT
DEER MOUSE
COTTONTAIL RABBIT
HIND
FRONT
SNOWSHOE HARE
HIND
FRONT
BOBCAT
FRONT
HIND
RED FOX
HIND
FRONT
COYOTE
FRONT
HIND
WOLF
FRONT
HIND
WHITETAILED DEER

Reprinted from Michigan Wildlife Sketches
Distributed by Department of Natural Resources

Transparency #2

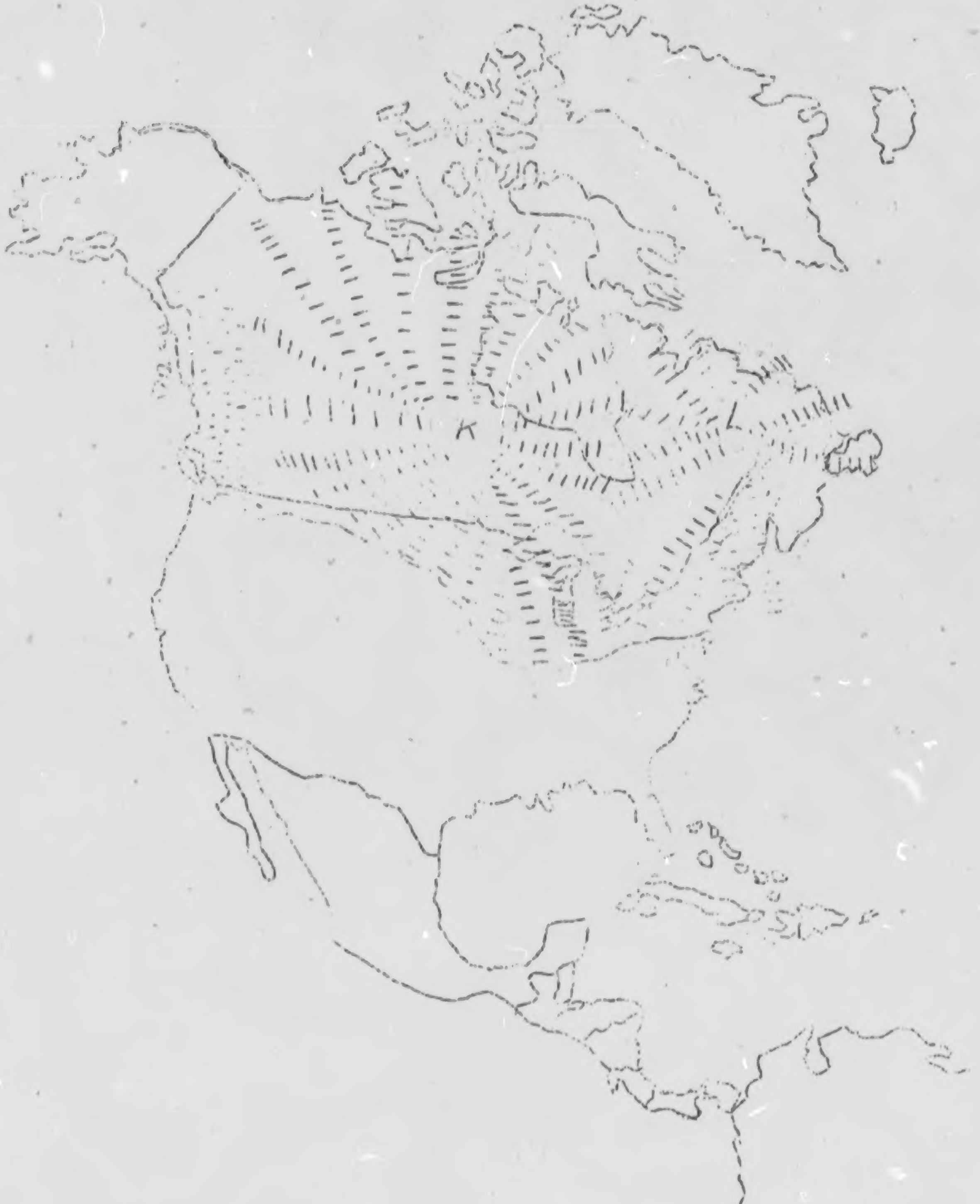


SYSTEM	SERIES	GROUP, STAGE	FORMATION, UNIT	COLUMN	THICKNESS (feet)	DESCRIPTION
QUATERNARY	Pleistocene	Recent				Alluvium, dune sand
		Wisconsinan	Peoria		0-15	Loess, tan
			Farmdale		0-5	Silt, peaty
			Roxana		0-5	Loess, pinkish tan
		Illinoian			0-15	Till, yellow brown
SILURIAN	Niagaran		Racine		0-80	Outwash, sand, gravel, silt
					80	Dolomite, pure, massive to thin-bedded
			Waukesha		50	Dolomite, pure, massive
			Joliet		45-50	Dolomite, thin-bedded, some chert
	Alexandrian		Kankakee		30	Dolomite, argillaceous, cherty
			Edgewood		5-90	Dolomite, argillaceous, thin shale beds at bottom
ORDOVICIAN	Cincinnatian	Maquoketa			90-200	Shale, green; some limestone beds; phosphate nodules at base
		Galena	Dubuque		25	Dolomite, argillaceous
			Wise Lake		75	Dolomite, pure, massive; Receptaculites in upper half
	Champlainian		Dunleith		130	Dolomite, very cherty, abundant Receptaculites in zones; shaly, thin-bedded at bottom
			Guttenberg		8	Dolomite, red shale beds
		Platteville			75-110	Dolomite, limestone, argillaceous, cherty
		Ancell	Glenwood		2-55	Sandstone, shale, dolomite
			St. Peter		50-300	Sandstone, pure, massive; shaly at bottom
CANADIAN (LOWER ORDOVICIAN) AND CROIXAN (UPPER CAMBRIAN) STRATA (undifferentiated)					1250	Limestone, dolomite, sandstone, shale
PRECAMBRIAN					66	Granite; other igneous and metamorphic rocks

Fig. 2 - Generalized sequence of strata in the Mt. Carroll area.

EXTENT OF NORTH AMERICA GLACIERS

Transparency #3



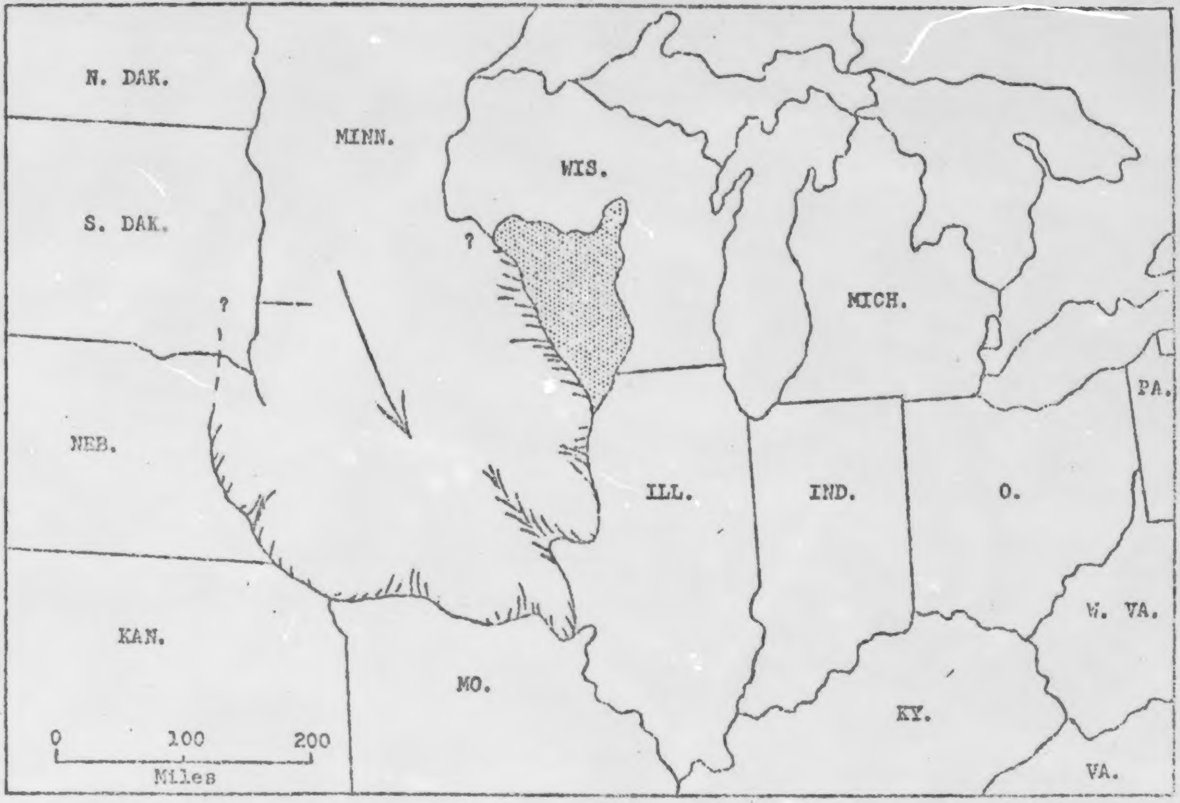

N. DAK.
MINN.
S. DAK.
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Fig. 5 - Maximum extent of Nebraskan glaciation (1,000,000 years ago). Driftless Area shown by stippled pattern. Arrow indicates direction of ice movement.

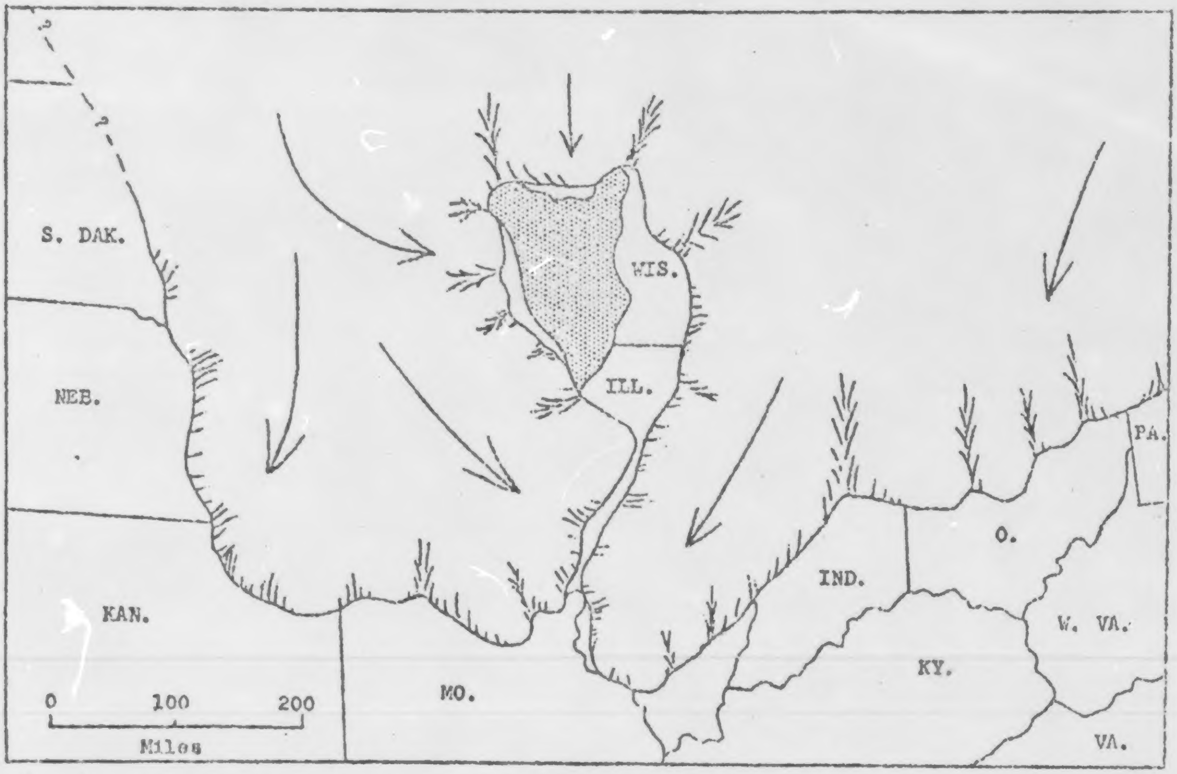
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Fig. 6 - Maximum extent of Kansan glaciation (700,000 years ago).

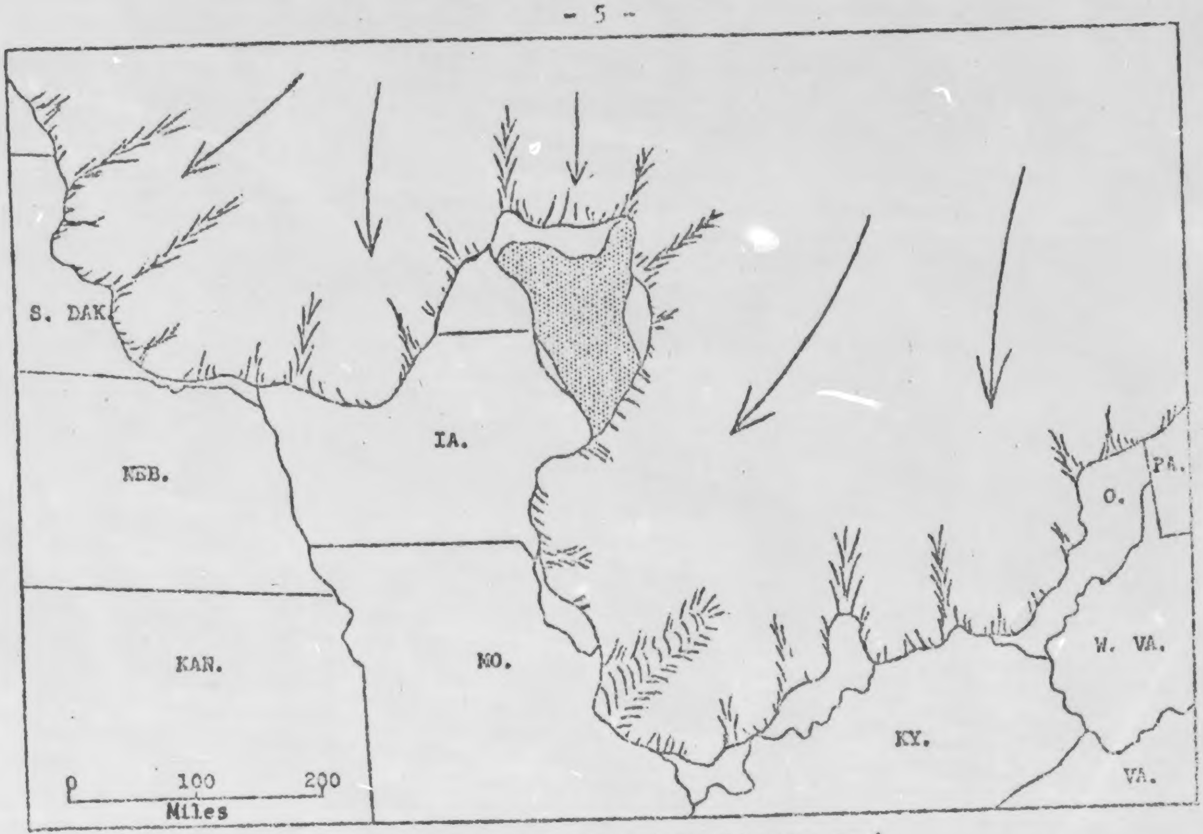
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Fig. 7 - Maximum extent of Illinoian glaciation (250,000 years ago).

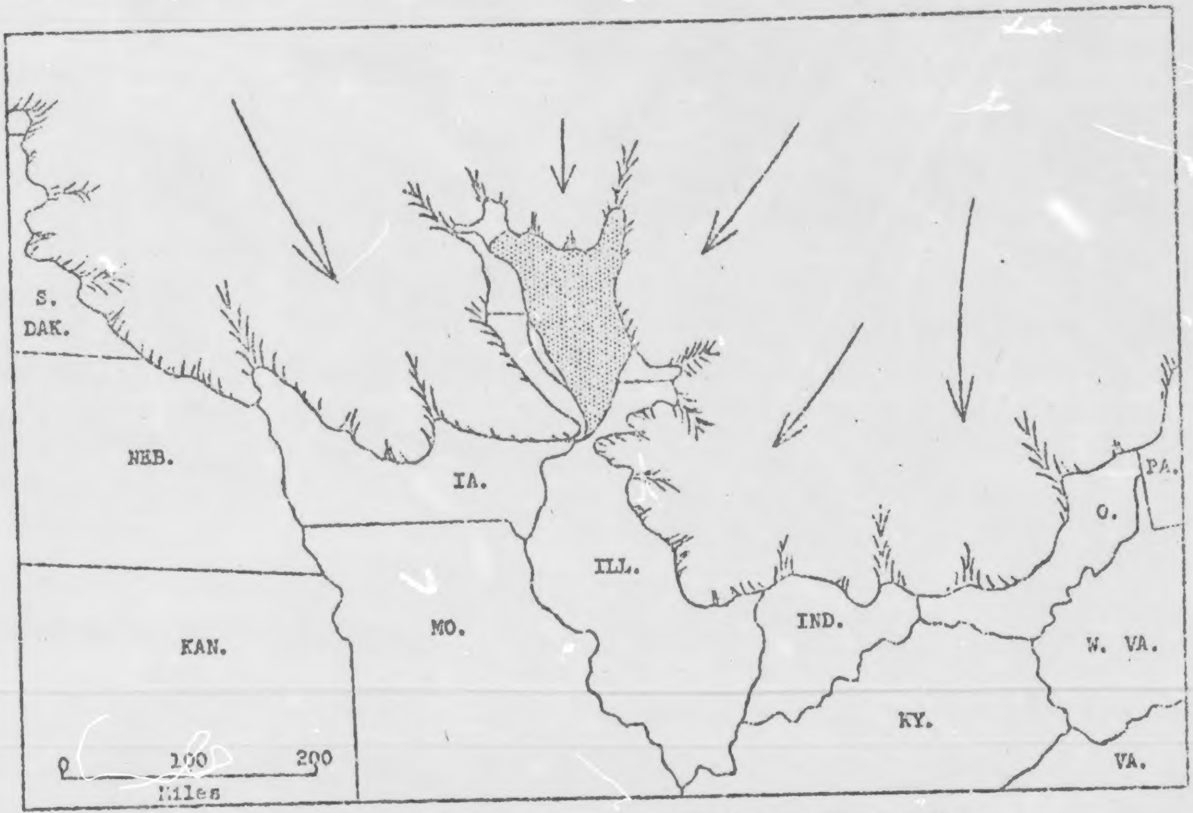
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Fig. 8 - Maximum extent of late Wisconsinan glaciation (20,000 years ago).

PREGLACIAL EROSIONAL HISTORY OF THE MT. CARROLL AREA

The topography of the field trip area has had a long history of development. Since the last Paleozoic sea withdrew at the end of the Pennsylvanian Period about 270 million years ago, the Upper Mississippi Valley region has remained a land area. During this long erosion interval many hundreds of feet of Paleozoic strata have been stripped away. During the Pliocene Epoch between 11 and 1 million years ago, near the end of the Tertiary Period, the region was reduced to an erosional plain of very low relief known as the Dodgeville Peneplain.

A peneplain is a land surface that has been worn down by stream erosion and mass wasting to a low, nearly featureless plain that gradually slopes upward from the sea. Such an erosion surface would require a very long time to develop and would be characterized by sluggish streams flowing in broad valleys. Bedrock structures, such as anticlines, would have no influence on the topography but would be uniformly beveled.

After the Dodgeville Peneplain was formed, the region was uplifted and another partial peneplain called the Lancaster Peneplain was eroded on the bedrock at a lower level. In the Driftless Area of Wisconsin, the Dodgeville surface is well preserved. In Illinois only remnants of the Dodgeville Peneplain are preserve in Jo Daviess County as isolated, flat-topped ridges and knobs of Silurian dolomite (fig. 12). When the tops of these Silurian flats are joined by an imaginary plane, a surface representing the former peneplain is formed that slopes gently southwestward from about 1150 to 1000 feet above sea level.

The Lancaster Peneplain, which occurs about 200 feet lower than the Dodgeville Peneplain, is extensively preserved on the bedrock surface of northern Illinois. It is well developed in the Driftless Area, and east of the Driftless Area it is a gently undulating surface covered by the glacial deposits. It closely coincides with the top of the Galena Dolomite and slopes southwestward from about 950 to 800 feet above sea level. The Mt. Carroll area is at the southern edge of the Lancaster Peneplain. The peneplain bevels the bedrock structure on the Savanna Anticline, so that the surface occurs on the Galena Dolomite, the Maquoketa Shale, and the Silurian formations (fig. 12). The surface slopes southwestward from about 925 to 850 feet at about 3 feet per mile in the Mt. Carroll Quadrangle. The Lancaster surface is evident by the evenness of the horizon toward the west, north

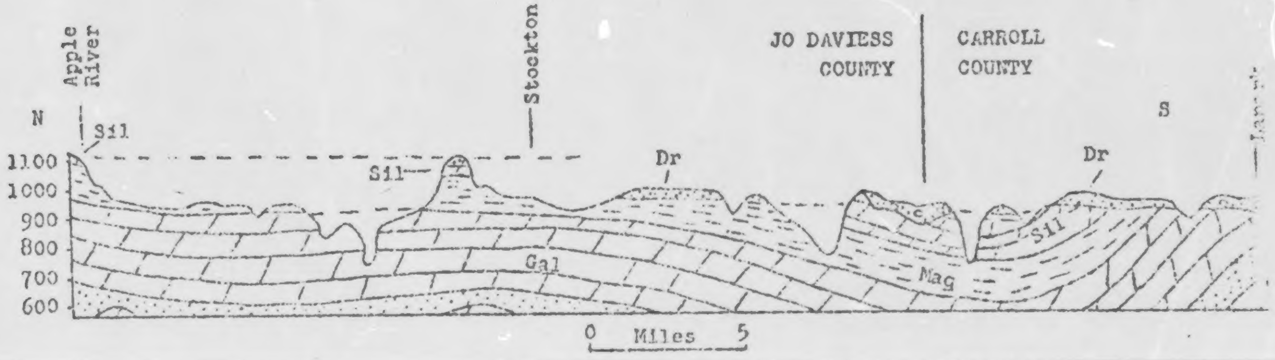


Fig. 12 - Cross-section showing Dodgeville (upper) and Lancaster (lower) erosion surfaces in northwestern Illinois and relationships to bedrock structure. Line of section is from Apple River to Stockton to Lanark. Dr, Glacial drift; Sil, Silurian dolomite; Maq, Maquoketa Shale; Gal, Galena Dolomite.

DIXON GEOLOGICAL SCIENCE FIELD TRIP

Introduction

The Dixon area is situated in the southern part of the Rock River Hill Country, a scenic region of gently rolling, glaciated uplands. The undulating topography reflects the irregularities of the bedrock surface that is only thinly mantled by unconsolidated glacial deposits. During the Pleistocene Epoch, commonly referred to as the "Great Ice Age," the region was covered by continental glaciers of the Illinoian and Wisconsinan Stages (see attached Pleistocene Time Table). The Illinoian glacial deposits in the Dixon area were largely stripped away by stream erosion during the warm Sangamonian interglacial interval and later by glacial erosion during the advance of the Early Wisconsinan glacier. The only evidence of the Illinoian glaciation comes from deep water well borings in buried bedrock valleys such as Ancient Rock River Valley, where patches of Illinoian deposits are preserved beneath the younger Wisconsinan drift. The Wisconsinan glacier covered the Dixon area during two separate advances--the Altonian (Winnebago) and the Early Woodfordian (Shelbyville). Drifts of Altonian and Woodfordian ages are extensively exposed in the field trip area (see Itinerary Map and map of Glacial Geology of Northeastern Illinois). The last glacial ice melted from this area about 17,000 to 18,000 years ago.

Beneath the glacial drift the Dixon area is underlain by approximately 3,700 feet of Ordovician and Cambrian sedimentary strata consisting of limestone, dolomite, sandstone, and shale (fig. 1). These rocks were laid down layer by layer in the ancient seas that covered Illinois and the Midwest during the early part of the Paleozoic Era between about 550 to 450 million years ago. The upper 1,000 feet of these rocks down to the Cambrian Franconia Formation are exposed in the field trip area. Approximately 2,700 feet of older Cambrian rocks are known only from deep drill holes. The base of the Cambrian rocks rests upon an ancient basement of Precambrian igneous and metamorphic rocks more than one billion years old. Paleozoic strata younger than those exposed in the field trip area occur to the west, south, and north (fig. 2 and Geologic Map of Illinois).

Limestone
Dolomite
Sandstone
shale.

Geologically the Dixon area is situated along the northern margin of the Illinois Basin, a large, spoon-shaped depression underlying most of Illinois and adjacent parts of Indiana and Kentucky. The basin is now filled with the Paleozoic sedimentary rocks. Beginning in Late Cambrian time about 500 million years ago the Illinois Basin became a slowly subsiding (sinking) region, and this continued intermittently until the end of the Pennsylvanian Period some 280 million years ago. Southward the Paleozoic rocks thicken to more than ten thousand feet in the deepest part of the basin in extreme southeastern Illinois. Regionally the sedimentary layers are also tilted gently southward into the basin (fig. 2). Toward the north they thin as they rise onto a broad domal uplift known as the Wisconsin Arch in north central Wisconsin. In the central area of this uplift the Precambrian rocks that are deeply buried in the Illinois Basin rise to the bedrock surface and are exposed in many places. The Cambrian strata below the Franconia Formation are also exposed around the margin of the dome.

The Dixon area is one of the geologically complex areas in Illinois, and several interesting structural features including the Ashton Arch, the Sandwich Fault, the Oregon Anticline, and the LaSalle Anticline interrupt the regional southward slope of the strata (figs. 2 and 3). The major structure is the Ashton Arch, a broad, high anticline which extends for 80 miles southeastward from the Rock River, past Ashton (from which it receives its name), into Kendall County.

The Cambrian rocks rise to the bedrock surface along its crest, providing the only exposures of these ancient rocks in Illinois. Along its northern flank the Ashton Arch is bounded by the Sandwich Fault, a major zone of fracturing along which the strata on the north side have moved down relative to the strata to the south.

The bulk of the Cambrian and Ordovician strata exposed in the Dixon area consists of limestone and dolomite that provide the basis of the area's mineral industry. Ordovician limestone is quarried at Dixon for the manufacture of cement. Crushed limestone and dolomite are also produced for use as roadstone, concrete aggregate, and agricultural lime (agstone). The glacial deposits of the area are important sources of sand and gravel for the building industry. The pure quartz sandstone of the Ordovician St. Peter Sandstone is an important source of silica sand for the glass and ceramics industry, and is being extensively quarried in the vicinity of Oregon.

Glacial History of Illinois

Thousands of years ago much of northern North America was covered by huge glaciers. These glaciers, which advanced from centers in eastern and central Canada, developed when the mean annual temperatures were a few degrees lower than they are now, and the winter snows did not completely melt during the summers. After many years a sheet of ice accumulated that was so thick its weight caused it to flow outward, carrying with it the soil and rocks on which it rested and over which it moved.

The Pleistocene Epoch or "Great Ice Age" began about one million years ago and ended about five thousand years ago. During this epoch, there were four major stages of glaciation, each followed by a long interglacial stage characterized by climatic conditions much as they are today (see diagram on next page and attached Pleistocene Time Table in back of guide leaflet).

The oldest glacial stage is the Nebraskan, named after the state of Nebraska where extensive Nebraskan deposits are buried beneath the younger glacial deposits. In Illinois the Nebraskan deposits are also buried, and there are only rare exposures of Nebraskan till in extreme western Illinois. A warm climatic interval, called the Aftonian (interglacial) Stage, followed the melting of the Nebraskan glacier.

The next glacial climate produced the Kansas glacier, which left thick deposits of fine rock materials and outwash sand and gravel in Illinois when it melted away. The Kansan Stage was followed by the Yarmouthian (interglacial) Stage. During this stage, erosion carved valleys and hills, and soils were formed in the Kansan deposits.

The third glacial stage, the Illinoian, is particularly important to the residents of Illinois. The Illinoian glacier, in three separate advances (Liman, Jacksonville, Buffalo Hart), covered 80 percent of the state, reaching southward to Carbondale and Harrisburg. After several thousand years, a warm stage caused the Illinoian ice sheet to melt. During this warm stage, the Sangamonian, the upper part of the deposits left by the glacier was weathered and soil developed, as in the preceding Yarmouthian interval. These ancient Sangamonian soils resemble present-day soils in color, texture, and depth, suggesting that the climate during interglacial times was similar to our present climate.

The last and most recent glacial stage in Illinois was the Wisconsinan, which began about 70,000 years ago. The Wisconsinan comprised three major glacial advances—the Altonian, the Woodfordian, and the Valderan. Little is known about the extent of the Altonian glacier, as its deposits were overridden by later glaciers, except in northern Illinois. The Woodfordian glacier advanced southward from the Lake Michigan basin to the present sites of Shelbyville, Decatur, Charleston, and Peoria. The Valderan glacier reached its maximum extent near Milwaukee, Wisconsin, and did not enter Illinois.

When the glaciers melted, they released the rock materials they had picked up as they advanced. These materials are called glacial drift. Glacial drift deposited directly by the ice is called till. It is unsorted and unstratified and consists of a mixture of all kinds and sizes of rock fragments. As the Wisconsinan glacier wasted away, the ice front melted back and readvanced many times, creating a complex sequence of till deposits in northeastern Illinois, the most outstanding of which are end moraines. More than 50 successive end moraines were formed by the Wisconsinan glacier in Illinois alone. The major ones are shown on the accompanying glacial map of northeastern Illinois.

Some of the glacial drift was washed out with the meltwaters and is called outwash. Outwash is layered or stratified. The coarsest material (gravel, sand) carried by the meltwater was deposited nearest the ice front, and the finer material (silt,clay) was carried farther away, with some possibly carried all the way to the sea. Where the outwash was spread widely along the front of the glacier, it formed an outwash plain. Where the outwash was restricted to the stream valleys, it formed valley train deposits. Many valley trains in Illinois are buried beneath younger glacial drift.

An end moraine is an accumulation of drift at the ice margin when the rate of advance and the rate of melting of a glacier are essentially in balance. As more and more rock debris is brought to the edge of the glacier, it piles up and forms a ridge.

The surface relief of end moraines is generally greater than that of the surrounding area and is referred to as swell-and-swale or knob-and-kettle topography. At some places there are large gaps in the moraines where subglacial streams presumably carried away most of the drift. The flatter areas behind end moraines are called ground moraines or till plains.

At times, especially in the fall and winter, the meltwaters subsided, exposing the valley trains. The wind picked up silt and fine sand from the floodplains and dropped these materials on the bluffs and uplands to form deposits of loess. Loess mantles most of Illinois. Near the large river valleys it may be as much as 60 to 80 feet thick, but it thins rapidly away from the valleys.

The importance of the Pleistocene Epoch to Illinois is emphasized by the rich soils formed from the glacial deposits and by the abundant deposits of sand and gravel. The glacial outwash, especially buried valley trains, is an important source of ground water. The state would not have these valuable resources if the glaciers had not invaded Illinois.

Preparation and Follow-up Sheet
for teachers using The Stronghold
Geology Trail With Fifth Graders

Prepared by Carol Leslie and Dara Nicklaus

This geology trail can have some value if used by itself as part of the fifth grader's outdoor experience. However, it will be much more effective if it is used as part of a geology unit.

EQUIPMENT NEEDED FOR THE TRAIL:
- Baggies and tabs
- Hydrochloric acid
- Thermometer
- Collection Bag or Box
- Students' Booklets
- Pen or Pencil

Preparation: These are the terms that the children will need some introduction to before going on the trail:

- bedrock
- glacier
- limestone
- sandstone
- sedimentary
- glacial erratics
- quarry
- dolomite
- outcropping
- weathering
- topsoil
- fossil
- geologic time
- glacial till
- deposited
- eddies

In addition to the vocabulary, the students should have a basic understanding about the causes and effects of geologic changes.

Since all the 5th grade teachers have the same Science, Social Studies, and Reading books, we will use those for our main references. Also, the book, Tips and Tricks by Malcolm Swan will be used and it is located in each school library.

These are the references and pages which will help you with your unit:

Science: Elementary School Science T.E. pgs. 143, 148, 149, 150-51, 152-53, and 158-59.

Social Studies: Exploring Regions of the U.S. T.E. glaciers pgs. 325, 328, 115, and 20.

Tips and Tricks: pgs. 74-75

Also, use the encyclopedias and don't forget to use the resource people on your staff. Not all the terms are within your books, so a good source would be to utilize your librarian and find books on landforms and geologic times.

Follow-up Activities:

For testing the soil samples, see your Science text, pgs. 144-47 and pg. 149. Also, see Tips and Tricks, pgs. 83-85, and pg.86.

For the rock collection, see your Science text, pgs. 148, 152-53, and pg.154. Also, Tips and Tricks, pgs. 67-70, 76-77, 77-79, and 80-82.

Another good resource is: The Identification of Rock Types, U.S. Dept. of Commerce, Bureau of Public Roads. You can write for this booklet or ask Carol Leslie about it.

An additional source is : The Modified Key To Common Rocks For Northern Illinois. You can obtain a copy of this from either Carol Leslie or Dara Nicklaus.

There are several ways to incorporate this into your other curriculum areas too:
Reading: Level 11, Tell Me How The Sun Rose. There is a story on the Ice Age, pgs. 286-301.

Lang. Arts: Develop a story form there outdoor experience or write letters to companies for rock displays.

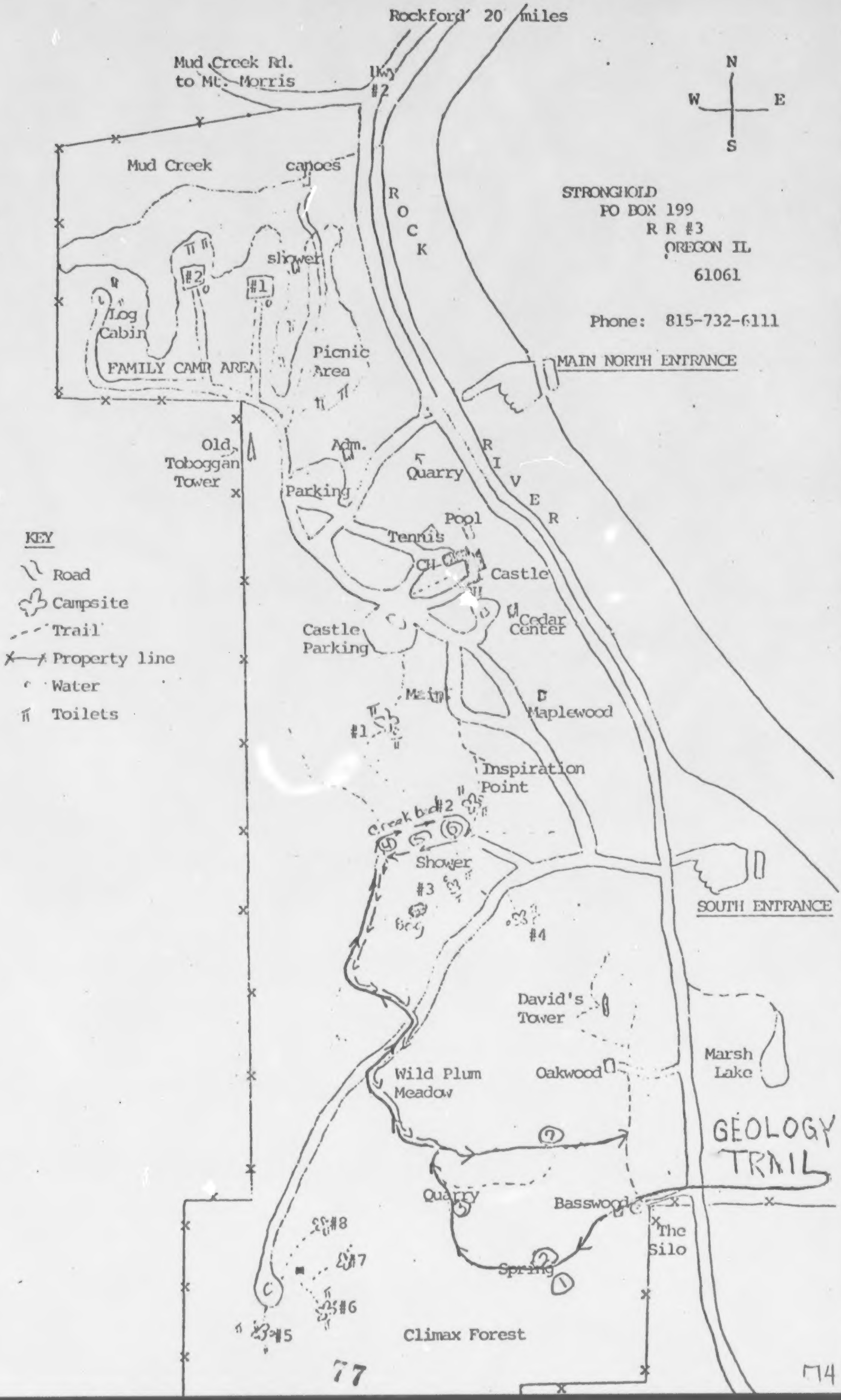
Mathematics: Calculating geologic time-see the supplementary sheet on geologic events.

Also, you may wish to expand your students understanding of the ways local rocks are used by man by taking a field trip to a quarry. A trip could be arranged to the Dolomite Quarry at Lee Center during the week or to the Dolomite Quarry in Byron near the nuclear plant site. It might also be possible to arrange a trip to the Martin-Marietta Sandstone Quarry at Oregon which produces silica sand from St. Peters Sandstone. Carol Leslie will help you arrange these trips if you are interested.

One way to help your students understand the concept of Geologic time is to compress 1 year of geologic time into one minute of our time.

For example your 5th graders are 10 years old in true time, in compressed time they are 10 minutes old. The Declaration of Independence was signed 201 years ago - in compressed time it would be 3 hours 21 minutes.

	TRUE TIME	COMPRESSED TIME
Christ's Birth	2000 yrs.	33 hrs. ago
End of Wisconsinan Stage (Wisconsinan Glacier)	12,000	8 days, 8 hrs.
Beginning Wisconsian Stage	75,000	52 days ago
Beginning Nebraskan	1,000,000	1 yr. 11 mo.
Man	3,000,000	5 yrs. 9 mos.
End of Ordivician Period	395,000,000	750 yrs. ago
Beginning of Ordivician	480,000,000	913 yrs. ago
Formation of the Earth	4 1/2 billion	8600 years


Rockford 20 miles
Mud Creek Rd.
to Mt. Morris
Hwy
#2
N
W
E
S
Mud Creek
canoes
R
O
C
K
shower
#2
#1
Log
Cabin
FAMILY CAMP AREA
Picnic
Area
MAIN NORTH ENTRANCE
Old
Toboggan
Tower
Adm.
Quarry
Parking
R
I
V
E
R
Pool
Tennis
CH
Castle
Castle
Parking
Cedar
Center
Main
Maplewood
#1
Inspiration
Point
Creek bed
#2
Shower
#3
#4
SOUTH ENTRANCE
David's
Tower
Marsh
Lake
Oakwood
Wild Plum
Meadow
GEOLOGY
TRAIL
Quarry
Basswood
The
Silo
Spring
#8
#7
#6
#5
Climax Forest
KEY
Road
Campsite
Trail
Property line
Water
Toilets

STRONGHOLD
PO BOX 199
R R #3
OREGON IL
61061

Phone: 815-732-6111

M4

Teacher's Guide To Be Used With The Geology Trail At Stronghold Campus

Equipment Needed:
thermometer
baggies
hydrochloric acid
collection bag or box

Note: Teachers, in this guide, you will find the answers to the questions that correspond with the student booklet. In addition, there will be some ideas given for further discussion at each stake. Or perhaps, you will want to add ideas of your own.

Stake 1: The student's question is: Where do you think the spring came from? Let the students record their answers and then discuss them. Here's the correct answer: The rain that falls on the hilltop works its' way down through the soil and rocks until it comes to a crack in the bedrock. The water then follows the crack to the side of the hill. Discuss the term bedrock and ask someone in the class to define or tell about it. Bedrock is a piece of rock sticking out of the ground and at other times, it is solid rock that continues underground without coming to an end.

After the children feel the water, have one student take the actual water temperature for the group.
Yes, they can drink the water. It is not polluted and is chemically safe. Perhaps, you may want them to take a sample to have tested at the local water department.

Stake 2: Point out to the students after they look for rocks that many are limestone and come from the bedrock in this area and some by glaciers. Here you might want to discuss the terms; glacier, limestone, sandstone, sedimentary rocks and glacial erratics. Let them search and show you their rocks. If they aren't sure what rocks fit which category, don't tell them as you can experiment
later at school.
later at school.

Stake 2: Teachers, don't worry if you can't identify all the rocks. You can key them out with your students back at school.
Rock Collection: This is where we will begin our rock collection as a group. Everybody may look for rocks on their own but only the best specimens and only one of each kind should be added to the collection bag.

From Stake 2 to Stake 3, have the students record their number of steps taken. Explain why they are going to do this: each step they take represents 1 million years in geologic time. They will have this in their booklets, but they may need further explanation. For example, if you walk 100 steps, then that would equal how many years? They will continue counting from stake 3 to the quarry sign.

Stake 3: Discuss the term quarry. What is it? Have you seen a quarry before? The students will be experimenting with hydrochloric acid-have one student do it. Procedure: take and put one drop of H.C.L. of the rock. Tell the children to observe what happens and let them record their answers. Discuss their findings ans conclusions. If it fizzes, it is limestone. If it doesn't, then it is dolomite.

They are looking at a man-made outcropping. Start some discussion on the difference between man-made outcropping and natural outcropping.

As the children sketch, encourage them to draw it so they will remember something different about it or perhaps a shape or a face etc. .

After they answer the ques. on roots, make sure they understand that the roots are causing vertical cracks and also helping the rock to disintegrate to form soil. Have the children point to the topsoil and then really feel the rock and rub it in different places.

They should conclude that the freezing and thawing have affected the limestone by the breakdown of the rock and closer to the surface, the rock particles become smaller.

This is the weathering process. The black topsoil is a mixture of decayed vegetation(roots, grass, etc.) and fine rock particles (soil).

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Stake 3 continued: The students may show excitement about fossils. Make sure each student knows what a fossil is.

* They may not find any here. This is a good thought provoking question for them: Why didn't you find any here? Look at the quarry carefully. Fossils are sometimes concentrated in particular rock layers. Since so few layers are exposed here, fossils are largely absent.

Again, remind the students to record their steps from here to the sign marked, QUARRY, which will be on your left as you come to the top of the hill.
After the students arrive there, tell them to add their steps taken from stake 2 to 3 and from 3 to the quarry sign.

* If the students have connted 400 steps or more, they can figure they have walked 400 million years in geologic time. You may want to expand on this by telling the students to take their age and calculate how old they would be in geologic time; for ex.; 10 yrs. old = 10 mins. in condensed geologic time.

* Ideas for questions: How long ago were the glaciers here? Answer: The last one left here 12,000yrs. ago Which way did they travel? Answer: North
What caused the long hills we were climbing? Answer: Rock River has cut the valley between the bluffs on either side. This is the west bluff.

Directions to the next stake: after discussion, turn left at the top of the hill. As you look ahead from the quarry sign, you will see a tree with blue marks on it. When you get to the sign, Plun Meadow which will be on your left, turn right and travel down the road until you see another tree with three blue dots on your left. Pass the tree for about 10 steps and take the trail to your left until you come to the creekbed.

Caution: At the quarry sign, when you look ahead, you should see the tree with the blue dots. That is when you turn left and walk until you see the Plun Meadow sign on your left. Then you will turn right.

As the students enter the creekbed, they can look for rocks and fossils.

As the students enter the creekbed, they can look for rocks and fossils. Have them continue until they see stake 4.

Stake 4: Direct the students to look at the grey soil. Discuss glacial till. As the glaciers moved, they carried gravel, sand, silt, and clay in front and within the ice. As the ice melted and retreated, this mixture was left on top of the bedrock.

Let all the students feel the soil and have one student take a small sample to test back at the classroom.

Again, have the students look for glacial erratics. These are the rocks left from the glaciers. Look at their various colors and shapes.

Have the children find the 6" gravel layer that was left behind by the melted glacial water. The melt water flowing from the ice carried silt and clay down the valley. The heavier sand and gravel particles settled on top of the hill; the finer particles were carried further downstream.

Above the gravel layer is 2ft. of silty sand that the wind probably brought from the Rock River valley after the glacier had receded far to the north.

Question: How do we know the wind carried it? Ans. The very fine texture and uniform size suggests that it is wind deposited. However, it may have been deposited in slowly flowing water.

Have the students discuss why the roots are exposed. Answer: The creek has eroded away the soil and washed it away.

Idea questions: Should the trees be left as they are or should we try to build the land back up?

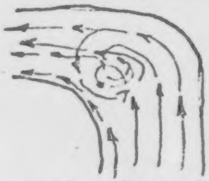
Continue around the curve to your left to stake 5.

Stake 5 : What makes these two glacial tills? Answer: The obvious differences in the texture of the layers. The fact that the top layer is composed of boulders, gravel, sand and soil suggest that it was deposited as a unit as ice would have done. This is probably the result of a minor secondary ice advance across the barren rock hills.

Have the students sketch these tills. When they finish, let them compare their drawings.

Continue to stake 6.

Stake 6: After the students record their answers, discuss what happens when the water eddies or turns. Sketch:



The water slows down and makes a circular shape and deposits the soil and silt.
After this, perhaps you may want the class to take another soil sample.

Have the students retrace the trail back to the quarry sign-don't stop there but continue on into the meadow to find stake 7.
Teachers: Here you may want to have a silent walk for the students to record sounds or have them observe the trees and flowers.

Stake 7 : The students will see a glacial erratic. Have the students feel it, draw it and describe it with adjectives. Explain that this is granite. Compare it to limestone.

Ideas for discussion: Why is this meadow here? Why didn't the glaciers affect this meadow or did it?

This is the end of the geology trail. If you would like to do further study with land forms or fossils, there is a quarry located at the north-end of the campus.

Be sure to check your reference sheet for further follow-up activities.

THE END!
LA FIN!

Page numbers refer to Golden Nature Series Rocks & Gems

MODIFIED KEY TO COMMON ROCKS FOR NORTHERN ILLINOIS

1. Rocks composed of small grains, crystals or pebbles large enough to be seen with the naked eye or under a hand lens -2.
1. Rocks composed of rather large crystals, fragments or pebbles, some particles exceeding one-half inch in size -12.
1. Rocks dense in texture, with no separate particles visible to the naked eye or under a lens -15.

2. More than one mineral present; more than one color apparent, "salt-and-pepper" patterns -3.
2. One mineral in excess, one color predominates -6.

3. Minerals in rather distinct layers or bands -4.
3. Minerals not arranged in distinct layers; rather uniform pattern of colors throughout the specimen -5.

4. Banding conspicuous and of varying width; structure solid; gray, white, pink or red varieties; generally light-colored. GNEISS p. 138
4. Bands very narrow; rarely wavy; structure flaky; generally dark colored. **SCHIST** p. 136

5. With quartz grains that appear glassy under a lens and/or with mice and/or other blackish minerals throughout; generally rather coarsely crystalline; occurring in gray, whitish, pink or even red varieties. **GRANITE** p 111 139-154
5. Without quartz; much more feldspar (a light colored **mineral**) than mice and/or hornblende (a black mineral). Generally coarsely crystalline and light gray in color. SYENITE p. 112
5. Without quartz; with more hornblende than feldspar. DIORITE p. 113

6. Mostly light-colored, very hard, glassy crystals. QUARTZ p 76 & p. 111
6. Mostly sand particles visible, or otherwise not as above -7.

7. Mostly sand particles present; will scratch glass -8..
7. Mostly blackish or greenish crystals present -9.
7. Mostly grayish, whitish or brownish grains present; will not scratch glass -10.

8. Crumbles when scratched with an iron nail. SANDSTONE p. 122
8. Too hard to be crumbled with a nail. QUARTZITE p 134

9. Coarse-grained; crystals easily seen with the naked eye; color very dark, often greenish, with "salt-and-pepper" pattern. GABRO p. 113 + 154
9. Fine-grained; crystals visible under a hand lens; freshly broken surfaces should be examined. DIABASE (gray); SERPENTINE (greenish). 75 & 107
154

10. Bubbles plainly visible under acid -11.
10. Bubbles hardly visible under acid, except with magnifier. DOLOMITE 155

11. Crystalline structure visible on close inspection. MARBLE 134
11. No crystals visible, except rarely, calcite in "Pockets." LIMESTONE 126

12. Well-rounded pebbles and sand grains cemented together like plums in a pudding. CONGLOMERATE 128

Most sedimentary rocks form in layers.

12. Angular, irregular fragments cemented together with fine materials. BRECCIA p. 128
12. Rocks of coarse crystals or similar fragments with no cement or apparently none; fused or pressed together -13.

13. Foaming under acid; scratched easily with a nail. CALCITE p. 64
13. Not forming bubbles under acid; much harder than iron nail -14.

14. Rocks consisting of more than one kind of mineral. PEGMATICE 112
14. Rocks coated with tiny glassy crystals. QUARTZ 76 - 111
14. Hollow rocks lined with glassy crystals. GEODE

15. Scratched easily with a fingernail -16.
15. Not as above; scratched easily with an iron nail -17.
15. Not as above; may scratch glass -20.

16. Rubs off easily on fingers; powders white. CHALK p. 64
16. Greasy or slippery to the rubbing action. TALC p. 74
16. Neither powdery nor greasy, but easily scratched with the fingernail or crow quill. GYPSUM p. 66

17. Splits readily into layers or sheets -18.
17. Does not split readily; fractures irregularly under hammer blow -19.

18. Dark gray, brownish or purplish-red; sometimes soft enough to be scratched with fingernail; may be broken by the hands into thinner layers. SHALE p 124 mudstone
18. Tougher than above; easily scratched with sharpened iron nail, knife blade, or awl; must be split with aid of cold chisel and hammer. SLATE p. 134 + 155

Raindrop [illegible] p 125

19. Rusty-colored; rarely froming bubbles under acid; CLAY-IRONSTONE 150 or gray, appearing in the form of rounded concretions. CLAYSTONE 150
19. Whitish or cream-colored; readily forming bubbles under acid. LIMESTONE, including STALACTITE and STALAGMITE. p. 126
19. Grayish, hardly forming bubbles, or very small bubbles visible under acid and hand lens. DOLOMITE 65 + 127

20. Dark-colored minerals in excess -21.
20. Light-colored minerals in excess -23.

21. Neither glassy nor shiny; dull black, greenish black or very dark gray. BASALT p 154
21. With smooth surface, shiny or waxy, but not glassy. Bull-colored; grayish or tan tints; chips with shell-like edges; fracture technically conchoidal -22.

22. Edge of fracture or chips translucent, waxy. FLINT p. 80
22. Edge of fracture or chips not translucent. CHERT p. 80

23. Broken surfaces dull; never glassy; pale shades of green, red, or gray, that is, light-colored, with a mixture of smaller and larger grains. FELSITE p. 110
23. Broken surfaces roughened, but glassy. If white: MILKY QUARTZ p. 79 If pink-tinted: ROSE QUARTZ 79
23. Broken surfaces dull, white or light or light brown; chips with shell-like edges -24.

24. Edge neither translucent nor transparent; light gray or light brown. CHERT 80
24. Edge translucent or transparent; with milky white or clear and colored bands or irregular markings. AGATE 81 SILICIFIED WOOD may also have this appearance. 81

PALEONTOLOGY

The aspect of natural history which deals with the remains of former life is called paleontology. The materials with which the paleontologist deals are called fossils. To become a fossil, a plant or animal must leave some remains behind after death. The most common fossils are shells of invertebrate animals, which, because they are hard, are the least likely to decay before they are buried and thus preserved in rock. Some types of rock contain more fossils than others, either because more plants and animals lived in the areas where the rock was forming, or because the rock has been less altered after it was formed. In the Chana region, the most abundant fossils are found in the limestones, particularly in one of the layers of the Platteville Group, the Mifflin Formation. Some fossils also occur in the dolomites, although they are not generally as well preserved as a result of the dolomitization. Fossils are rare in the St. Peter Sandstone, apparently because few animals could live in the pounding surf of the St. Peter beach, or after dying were broken into tiny bits.

Study of fossils has revealed a great deal about the characteristics of life on the earlier earth. They have revealed that life has gradually changed, both in its forms and complexity. For example, at the time the bedrock of the Chana region was formed, no land organisms had yet evolved. All life then in existence lived in the sea. Even the sea life of that time was much different than that at present. Following are brief descriptions of the major groups of animals which inhabited the Ordovician seas of the Chana region. (See two pages of illustrations immediately after these descriptions.)

BRACHIOPODS. The most common fossils are brachiopods. These bivalved animals superficially resemble modern clams, although they actually belong to a different phylum. Brachiopods are filter-feeding animals which obtain their food by extending arm-like soft structures outward from between the two shell halves and removing small plant and animal particles from the water. Some brachiopods forms are still living today, although the majority are now extinct. The Ordovician seas sustained a particularly rich brachiopod fauna, which numbered hundreds of known species.

BRYOZOANS. Bryozoans are small colonial filter-feeding organisms which build a communal skeleton. The most common variety resembles a branching twig in which the individual animals inhabit small cells. Other species form in crusting mounds, much like some modern corals, or lacy fronds which resemble ferns. Only a few bryozoan species are still living today although in Ordovician time they were one of the most abundant varieties of marine life.

GASTROPODS (Snails). Snails were very abundant in the Ordovician seas, even more so than in the present-day seas. Hence their fossils are among the most common varieties found in the Chana region rocks. The Ordovician snails also existed in a great variety of forms.

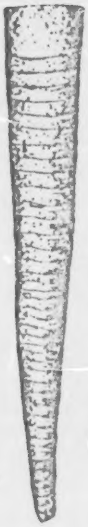
CEPHALOPODS. These relatives of the modern octopus and squid were the terrors of the Ordovician time. They were carnivorous and probably fed on all the other life forms of the time. Unlike their modern relatives, the Ordovician cephalopods possessed shells, out of the front of which extended their tentacled arms. Most of the Ordovician cephalopods built straight, conical shells, although in some species the shells were coiled. The straight shells superficially resemble vertebrae columns, for which they are often mistaken. Some of the larger cephalopods built shells over eight feet in length.

TRILOBITES. The most spectacular of Ordovician life forms were the trilobites. The trilobites are now totally extinct, although they belong to the same phylum as the modern spiders, crabs, and insects (arthropods). The trilobites derive their name because most forms had three distinct parts (as do the modern arthropods), a head region, a central region from which leg appendages grew, and a tail region. Trilobites are found in a variety of forms and sizes. Unfortunately, their shells were not as hard as those of some other animals, and hence they are usually not well preserved in complete fossils. Nevertheless, parts of trilobites are abundant, particularly the more resistant head parts.

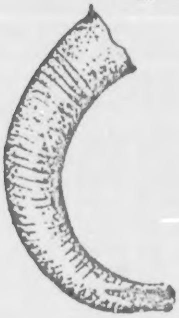
OTHER FOSSIL FORMS. Some of the other fossils which one may find are corals, crinoids, sponges, pelecypods, and ostracods. The most common variety of coral is the horn or cup coral. Crinoids were animals which grew on columnar stems. Usually, only the stems are preserved as fossils. Sponges are represented by the form Receptaculites. Pelecypods, the true clams, occur only rarely in Ordovician strata. Ostracods are micro-organisms, and, although abundant, can be seen only with a microscope.

(See illustrations of common fossils on next two pages.)

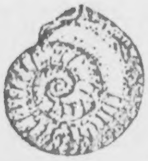
COMMON FOSSILS OF THE CHANA REGION



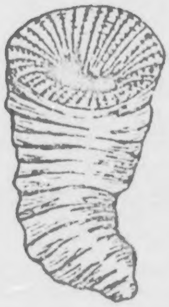
Straight cone



Curved cone

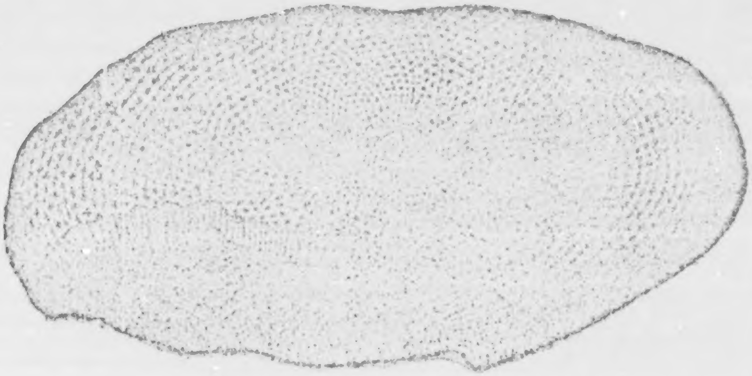


Coiled cone
(Nautilus)

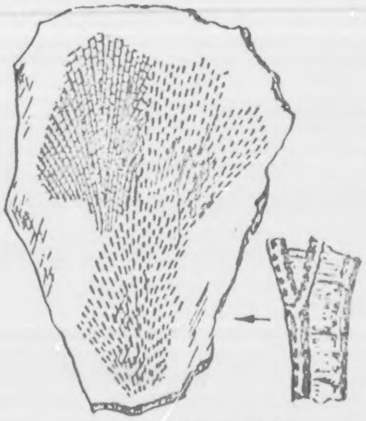


Cup coral

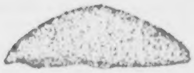
CEPHALOPODS



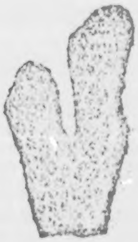
Receptaculites



Fenestella

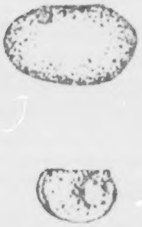


Prosopora

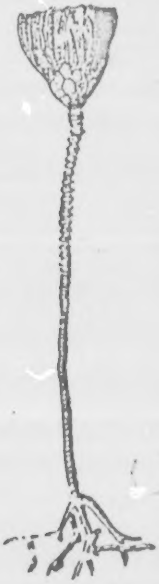


Constellaria

BRYOZOA

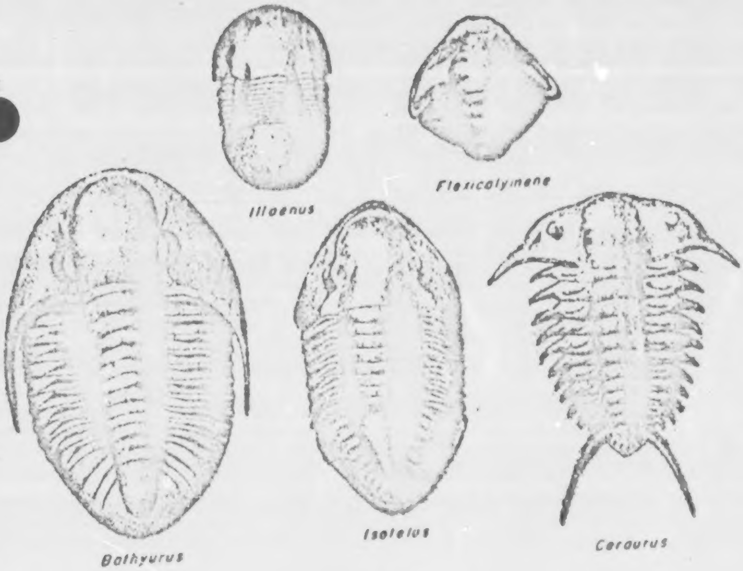


OSTRACODS
(greatly enlarged)

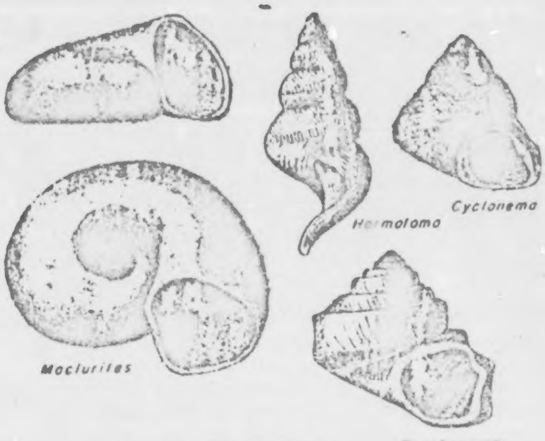


CRINOID

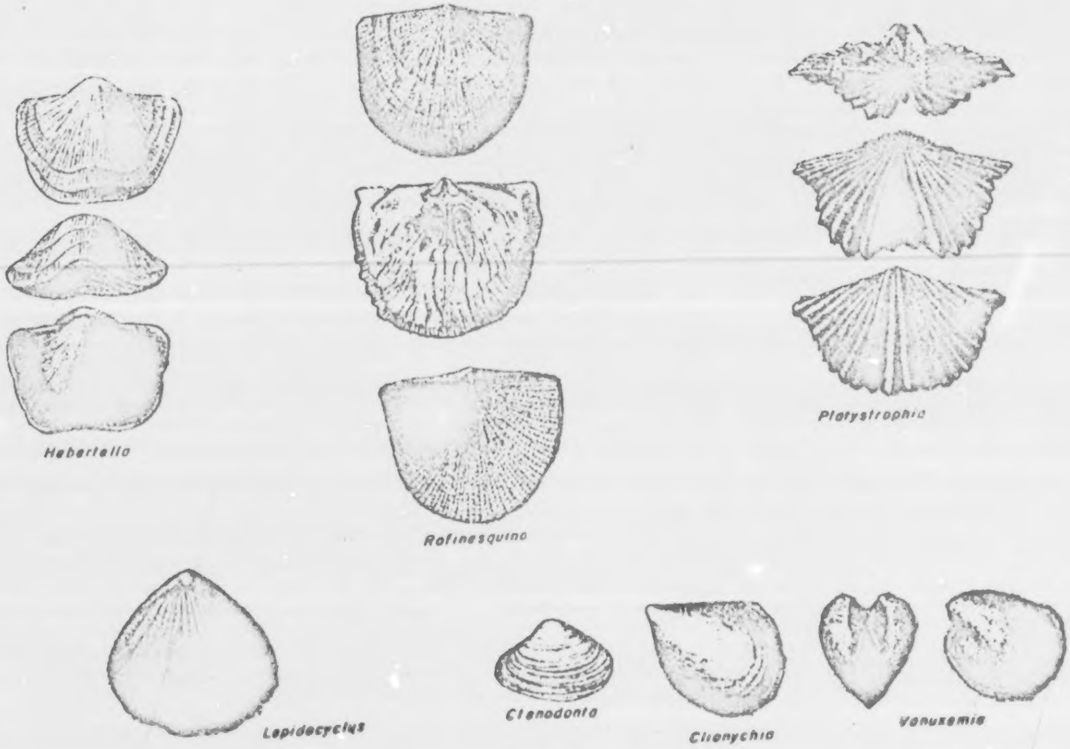
COMMON FOSSILS OF THE CHANA REGION


Illaenus
Flexicalymene
Bathyurus
Isotelus
Ceraurus

TRILOBITES


Hormotoma
Cyclonema
Maclurites
Trochonema

GASTROPODS


Hebertella
Rafinesquina
Platystrophia
Lepidocyclus
Ctenodonta
Clionychia
Vanuxemia

BRACHIOPODS

Key to Identification of Soil Animal Groups

1A. Segmented animals; with series of constricting rings around body. -2.

1B. Nonsegmented. -8.

- 2A. Segmented animals with jointed legs or other jointed appendages. -4.

- 2B. Worm-like segmented animals with no jointed appendages. -3.

3A. All segments similar, no well-defined head...earthworms
(phylum annelida)

3B. Head well defined. Harder and usually darker than the rest of the body. Mouthparts visible...insect larva
(phylum arthropoda)

- 4A. Animals with 3 pairs of legs ... (if wormlike.....Insect Larva)
(Insects)
- 4B. Animals with more than 3 pairs of legs. -5.

5A. With 4 pairs of legs...spiders, mites, ticks.

5B. With many pairs of legs. -6.

- 6A. With one pair of legs on almost every segment. -7.

- 6B. With two pairs of legs on most segments...millipedes.

7A. Oval-shaped animals; often fold body into ball when disturbed.
sowbugs or pillbugs.
7B. Elongated body, not folding it into a ball. centipedes.

- 8A. Minute non-segmented worms...nematodes.

- 8B. Soft bodies, slimy animals with or without a hard-coiled or spiral shell.
Slugs (without shells)
Snails (with shells)

ACTIVITY: School Yard Census

DISCIPLINE AREA: Science

PURPOSE: To help the student develop an awareness of the infinite variety of natural and man-made objects which are part of the school site environment.

OBJECTIVES: The student will

1. demonstrate his power of observation to identify natural and man-made objects on the school grounds.
2. display his aesthetic values by pointing out those items which have low aesthetic value and those which have high aesthetic value.

LEARNING ACTIVITY:

Student worksheet on the following page.

Census

Many of you may have hear of the "people" census that the government takes every 10 years. On the school yard there are many living things. There are also many things that man has put on the school site. Below is a check list. Take a walk around your school yard and check off all of the things you see.

Plants or Animals

ant or ant hill _____
squirrel nest _____
wasp nests _____
holes in ground made by insect _____
bird nest _____
bird _____
animal print _____
half eaten leaf _____
spider _____
earthworm _____
grasshopper _____
bee _____
insects on bark of tree _____
pill bug (sowbugs) _____

dandelion _____
clover _____
wild strawberry _____
sour grass _____
moss _____
shrub _____
vine _____
a yellow weed _____
lichen _____
gall _____
evergreen _____
broadleaf tree _____
mushroom _____
tree fruit _____

flagpole _____
fence _____
telephone pole _____
sidewalk _____
parking lot _____
play area _____
trash cans _____
fire plug _____
stop signs _____
bicycle rack _____
gutter _____
light meter _____
transformer _____
cement area (blacktop) _____

Which animal do you think is the most numerous on the site? __________

Which plant has the greatest number? __________ Why does this plant grow so well on the school site?

Which of the man-made items are pretty? __________ Which are ugly? ____
Could the ugly ones be made better looking? ________ How? __________

Specific Objective: Forest Study Using the Senses

Objectives:

Students will demonstrate an increase in their awareness of the aesthetic value of forest areas by using their five senses to explore the forest area.

Students will actively participate in the awareness exercise to develop a sensitization to the forest environment.

Learning Activity

This activity may best be done on a trail by: spacing children along the trail apart but within seeing distance of each other.

Material: none

General Survey

What are our five senses? Can we use them to study the forest?

Sight -
What do you see the most of? Are these things you see the only living things in the forest? What other things could live in the forest? Do you see their homes? Describe everything you see.

Hearing -
While on a trail take a silent hike. Do you hear any sound or sounds in the forest? Describe the sounds. What or who is making these sounds?

Feeling -
What do you feel as you stand in the forest? Describe what it is you feel? What do the trees feel like? What do their leaves feel like? Do all trees feel the same? What do the bushes feel like? What does the ground feel like? Describe all the feelings you are getting.

Smell -
Does the forest have any odors? Do the trees have any odors? The bushes, do they have any odors? The leaves, do they have any odor? Does the ground have an odor? What makes the ground smell the way as it does?

Taste -
There are many things in the forest that can be tasted but use caution when doing so. Be sure you know the plant!

Evaluation

Self-evaluation: the student could be asked to compare the way he felt about the forest before doing this exercise and after doing this exercise.

Specific Activity: Field Study of Soil

Objectives

Upon completion of the field study, students will demonstrate their knowledge of soil by:

a. being able to take a soil sample.
b. identifying the soil layers.
c. being able to tell how soil is formed from natural succession.

d. identifying three conservation methods designed to maintain topsoil.

Learning Activity

Materials needed: soil auger or small shovel, bags if samples are to be taken

Take soil samples from a prairie area and from the forest. Ask children the following questions about the soil they have sampled comparing the areas:

> What do you see?
> Do you see any small animals? What animals are most likely to live in the soil? Are there any layers in the soil? How many? What are these layers? What is the texture of the soil? Who or what benefits from the soil? How was the soil made? How can the topsoil be kept from eroding?

Discuss how the soil is made. This would include weathering, water, freezing, plant growth, and erosion (water, wind).

There are many follow-up studies that could be made back in the classroom.

Reference: **MacKillican,** William. Studying Soil. Toronto: The Ryerson Press, 1970.

Evaluation

Teacher observation, no formal evaluation is planned.

Specific Activity: Energy, Food Chains, and Webs

Objective

Students will demonstrate their knowledge of energy-capture and transfer of energy through food chains by constructing a food web from examples present at Bluffville.

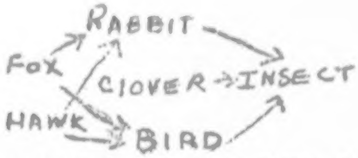
Learning Activity

Have the children sit in semicircles around the leader. The leader would then discuss the following terms with the students, using examples the children have seen at Bluffville.

Sun - original source of energy
Green Plants -- take energy, minerals, water, air and convert these materials to food. Green plants are producers, they are the only organisms that can convert the sun's energy so that it can be stored in food.
Consumers -- animals that live off plants or other animals
Predator -- animal that eats other animals thus getting a portion of that animal's stored energy
Prey -- animal that get eaten
Decomposer -- organism that breaks down material back into its essentials
Food chain -- showhow energy is passed on from one organism to another

producer	consumer	predator
clover	eaten by rabbit	eaten by fox

Food web - more complex



These concepts can be taught by having children think of examples for food chains from the living organisms at Bluffville. By using cards to label producers, consumers, and predators each child could become part of web held together by string to show the energy transfer.

Materials needed: None at all, or cards, markers, and string.

Follow up -- Draw food webs.
Try to make a food web for everything that lives in an area such as the school ground.

Evaluation

Students will be able to build a food web using examples at Bluffville. Students back in the classroom will be able to draw a food web.

Stream Study

1. Stream temperature:

2. Speed of flow:

3. Was there evidence of:

		Some	Little	None
a.	Large man-made objects in the water or on the banks? (such as old tires, etc.)	______	______	______
b.	Small man-made objects in the water or on the banks? (such as bottles, cans, papers, etc.)	______	______	______
c.	Oil on the water?	______	______	______
d.	Silt in the water?	______	______	______
e.	Excessive plant growth?	______	______	______
f.	Slime on rocks or sticks in the water?	______	______	______
g.	Unnatural color to the water?	______	______	______
h.	Dead fish in the water?	______	______	______
i.	Noticeable odor?	______	______	______
j.	Erosion on the banks?	______	______	______
k.	Paths of compacted soil along the banks?	______	______	______
l.	Trash being dumped on the banks?	______	______	______

4. What uses would you suggest for this stream?

5. What uses would you like to see this stream put to?

6. How could this be accomplished?

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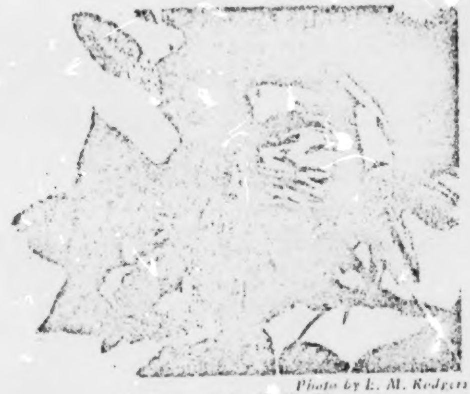

Photo by E. M. Kedrea

Flowers of the Tulip Tree

COMMON TREES AND THEIR LEAVES

by JOHN W. THOMSON
Associate Professor of Botany
The University of Wisconsin

DAVID E. YOUKER
Hubbard, Iowa

A richer and more varied world awaits the person who has learned to recognize the common trees that surround him. Instead of the blur of green that lines the highways, or the mass of unfamiliar foliage that appears as the forest, one looks for familiar tree shapes, well known flowers, or leaves, or fruits, or for new and interesting trees to add to one's store of knowledge. Every trip afield becomes a richer experience and each new tree an eagerly awaited adventure.

A few terms and a word of caution before beginning are necessary. Trees may have *simple* leaves such as those in figures 17 to 57. Or the leaves may be *compound* as in figures 1 to 16. The position of the bud (in the axil or place where stem of leaf is attached to twig) determines whether one is dealing with simple or compound leaves. Be sure when picking the leaf to collect the entire leaf if it is compound. One should also be careful when picking the leaf to observe if the leaves are borne singly on the stem so that they are *alternate*, or are *opposite* each other, or are in groups of *whorls* of three or more around the stem. The venation of the leaf, and the arrangement of the leaflets in a compound leaf, may be *pinnate* like the barbs on a feather, figures 53 and 7, or *palmate* with the veins or leaflets radiating from a central point, figures 1 and 23.

Once you have mastered the trees in this bulletin you will enjoy going on to learn more of the common trees in your locality. There are several hundred kinds of trees in North America and the use of one of the regional manuals or more inclusive books listed in the references will help you to recognize these.

A KEY TO THE LEAVES OF THE COMMON BROAD-LEAVED TREES

1 Leaves compound with 3 to 41 leaflets—2.
1 Leaves simple, not compound—17.
  2 Leaves palmately compound, opposite, with 5 to 9 leaflets, a cultivated tree. Horse-chestnut, *Aesculus Hippocastanum*, Fig. 1.
  2 Leaves pinnately compound, with 3 to 41 leaflets—3.
3 Leaves opposite on stem—4.
3 Leaves alternate on stem—8.
  4 Leaflets 3 or 5, rarely 7, in number, coarsely toothed, often 3-lobed at base. Box-elder, *Acer Negundo*, Fig. 2.
  4 Leaflets 7 to 11 in number, toothed or without teeth—5.
5 Leaves and stalks hairy below. Red Ash, *Fraxinus pennsylvanica*, Fig. 3.
5 Leaves and stalks not hairy below—6.
  6 Each of the side leaflets with a stalk ¼" to ½" long. White Ash, *Fraxinus americana*, Fig. 4.
  6 Each of the side leaflets with no stalk or with a very short stalk ⅛" to ¼" long—7.
7 Leaflet stalk lacking. Black Ash, *Fraxinus nigra*, Fig. 5.
7 Leaflet stalk ⅛" to ¼" long. Green Ash, *Fraxinus pennsylvanica* var. *subintegerrima*, Fig. 6.
  8 Leaflets with edges entire, lacking teeth—9.
  8 Leaflets with toothed edges—10.
9 Leaves once compound with 7-15 leaflets on short stalks about ⅛" long. Black Locust, *Robinia Pseudo-Acacia*, Fig. 7.
9 Leaves once or twice compound with more than 14 leaflets on exceedingly short stalks less than ⅛" long. Honey Locust, *Gleditsia triacanthos*, Fig. 8.
  10 Leaflets with rounded shape and short abrupt points, see figures 9 and 10; edges sharply toothed, leaflets 2" or less long—11.
  10 Leaflets with more elongate shape and more tapering points, see figures 11 and 12; edges coarsely toothed, leaflets usually 3" or more long but some may be as short as 2"—12.
11 Leaflets woolly on both sides, tips rounded, imported ornamental tree. Rowan Tree, *Pyrus Aucuparia*, Fig. 9.
11 Leaflets hairless above and hairless or only slightly hairy below, leaflets more pointed, native tree. Mountain Ash, *Pyrus americana*, Fig. 10.
  12 Leaves 1½' to 4' long with 13 to 41 leaflets; edges of leaflets with only 1 or 2 course teeth at the base each bearing dark glands. Ailanthus, *Ailanthus glandulosa*, Fig. 11.
  12 Leaves less than 2' long, with 5 to 23 leaflets, edges of leaflets coarsely or finely toothed—13.
13 Leaves with 5 to 7 leaflets—14.
13 Leaves with 7 to 23 leaflets—15.
  14 Leaves with tufts of hairs along margin (seen with hand lens), especially below teeth. Shagbark Hickory, *Carya ovata*, Fig. 12.
  14 Leaves lacking tufts of hairs along the margin. Pignut Hickory, *Carya glabra*, Fig. 13.
15 Leaves hairy below, 11 to 23 leaflets, leaves 1' to 2' long—16.
15 Leaves lacking hairs below, 7 to 11 leaflets, leaves 6" to 10" long. Bitternut Hickory, *Carya cordiformis*, Fig. 14.
  16 Leaflets 11 to 17, sticky-hairy, pith of twigs chocolate brown, a pad of hairs above each leaf scar. Butternut, *Juglans cinerea*, Fig. 15.
  16 Leaflets 15 to 23, hairy but not sticky, pith of twigs pale brown, no hair pad above the leaf scars. Black Walnut, *Juglans nigra*, Fig. 16.
17 Leaf edge entire, lacking saw-teeth or lobing—18.
17 Leaf edge saw-toothed, wavy or lobed—21.
  18 Leaves alternate, margin slightly wavy, veins breaking up into fine network before reaching margin—19.
  18 Leaves opposite; or else opposite, alternate and whorled on the same tree—20.
19 Leaves broader toward the tip of the leaf, base wedge-shaped or rounded. Sour Gum, Tupelo, *Nyssa sylvatica*, Fig. 17.
19 Leaves broadest at the center or toward the base, base rounded or heart-shaped. Persimmon, *Diospyros virginiana*, Fig. 18.
  20 Leaves more or less heart-shaped, alternate, opposite, or in whorls of three, all on the same tree. Catalpa, *Catalpa speciosa*, Fig. 19.

Drawings ¼ natural size—by John W. Thomson

20 Leaves opposite on the twig, elliptical in shape, veins running back in toward tip of leaf. Flowering Dogwood, *Cornus florida*, Fig. 20.

21 Leaves opposite on stem, venation palmate—22.

21 Leaves alternate on stem, venation pinnate, or palmate in sycamore—25.

22 Base of the 5 lobes of the leaf narrower than outer part of the lobes, appearing pinched-in, underside silvery. Silver Maple, Soft Maple, *Acer saccharinum*, Fig. 21.

22 Base of the leaves not narrowed or pinched-in, underside not silvery—23.

23 Edge of the lobes saw-toothed, lobes roughly triangular in shape. Red Maple, *Acer rubrum*, Fig. 22.

23 Edge of the lobes with very few teeth, sides of the lobes almost parallel, giving lobes a squared appearance except for the very tip—24.

24 Leaves 5 to 7-lobed, sap of leaf stalk milky. Norway Maple, *Acer platanoides*, Fig. 23.

24 Leaves 3 to 5-lobed, sap of leaf stalk watery. Sugar Maple, *Acer saccharum*, Fig. 24.

25 Leaves palmately lobed—26.

25 Leaves simple or pinnately lobed—28.

26 Leaves of 3 shapes on the same tree (simple, mitten-shaped, or with 3 lobes) strongly resinous-scented when crushed. Sassafras, *Sassafras albidum*, Fig. 25.

26 Leaves alike on same tree, not strongly resinous-scented when crushed—27.

27 Tip lobe of leaf appearing notched or sharply truncate, venation pinnate. Tulip Tree, *Liriodendron Tulipifera*, Fig. 26.

27 Tip lobe of leaf pointed, three main veins of leaf palmately arranged. Sycamore, *Platanus occidentalis*, Fig. 27.

28 Leaves pinnately-lobed—29.

28 Leaves simple, not pinnately-lobed—34.

29 Tips of lobes sharp and bristle-pointed—30.

29 Tips of lobes rounded, not bristle-pointed—31.

30 Leaves dull above, the sinuses between the lobes reaching about halfway to the mid-rib. Red Oak, *Quercus rubra*, var. *borealis*, Fig. 28.

30 Leaves lustrous above, the sinuses reaching more than halfway to the mid-rib. Black Oaks, including *Quercus velutina*, *Q. ellipsoidalis*, *Q. coccinea* and other species which cannot well be separated on leaf characters. Fig. 29.

31 Leaves deeply lobed—32.

31 Leaves with shallow lobes, almost just wavy edges—33.

32 Underside white-hairy, tip lobe the largest. Bur Oak, *Quercus macrocarpa*, Fig. 30.

32 Underside light but not white-hairy, middle lobes of leaf the largest. White Oak, *Quercus alba*, Fig. 31.

33 Leaves with 6 to 8 pairs of veins. Swamp-White Oak, *Quercus bicolor*, Fig. 32.

33 Leaves with 10 to 16 pairs of veins. Chestnut Oak, *Quercus Prinus*, Fig. 33.

34 Leaves doubly saw-toothed (finer teeth upon the coarser teeth)—35.

34 Leaves singly saw-toothed—43.

35 Veins of leaves thick all the way to the margins, base usually conspicuously asymmetrical—36.

35 Veins of leaves tapering to a very fine size or breaking up into a fine network before reaching margins, base usually symmetrical (except Fig. 51.)—38.

36 Leaves usually 2½" to 4" long, smooth above, paler and slightly hairy below. Rock Elm, *Ulmus Thomasi*, (*U. racemosa*), Fig. 34.

36 Leaves usually 4" to 7" long—37.

37 Both sides of leaves rough-hairy. Slippery Elm, *Ulmus rubra* (*U. fulva*), Fig. 35.

37 Upper side of leaf rough, lower side smooth, or both sides smooth. American Elm, White Elm, *Ulmus americana*, Fig. 36.

38 Leaves borne in pairs on short spur-shoots of previous years' growth—39.

38 Leaves borne singly along the twigs—42.

39 Leaves triangular or rhombic in shape, bark white with conspicuous black triangular patches below the branches. Gray Birch, *Betula populifolia*, Fig. 37.

39 Leaves oval in shape—40.

40 Leaf stalks and twigs with wintergreen flavor, 9-12 pairs of veins—41.

40 Leaf stalks and twigs lacking wintergreen flavor, 8 pairs of veins, bark pinkish-white without black triangular patches below the branches. Canoe Birch, White Birch, *Betula papyrifera*, Fig. 38.

41 Bark dark, not separating into papery layers; leaves finely saw-toothed. Black Birch, *Betula lenta*, Fig. 39.

41 Bark silvery-yellow, separating into papery layers; leaves more coarsely saw-toothed. Yellow Birch, *Betula lutea*, Fig. 40.

42 Leaf stalks glandular-hairy, leaves ovate in shape, bark shreddy. Hop-Hornbeam, Ironwood, *Ostrya virginiana*, Fig. 41.

42 Leaf stalks lacking glandular-hairs, leaves narrower, longer-tapering at the tip, bark smooth, gray. American Hornbeam, Blue-Beech, *Carpinus caroliniana*, Fig. 42.

43 Leaves with dark glands at the juncture between the stalk and the blade, twigs and leaves with strong cherry-like flavor—44.

43 Leaves lacking dark glands at the juncture between the stalk and blade, twigs and leaves not strongly cherry-flavored—45.

44 Upper surface dull, leaves broadest toward outer end, tip abrupt, lacking stiff hairs to each side of base of mid-rib. Choke-Cherry, *Prunus virginiana*, Fig. 43.

44 Upper surface shining, leaves broadest toward the center, tip long-tapering, often with a row of stiff hairs on each side of base of mid-rib. Black Cherry, *Prunus serotina*, Fig. 44.

45 Leaves white-woolly below, especially when young, shining dark green above, coarsely toothed to palmately 3 to 5-lobed. White Poplar, *Populus alba*, Fig. 45.

45 Leaves not white-woolly below—46.

46 Leaves with flattened stalks—47.

46 Leaf stalks rounded in section—50.

47 Leaves rhombic (diamond-shaped) or triangular in general outline—48.

47 Leaves rounded or oval in outline—49.

48 Leaves diamond-shaped, base tapering, tree columnar in shape. Lombardy Poplar, *Populus nigra* var. *italica*. Fig. 46.

48 Leaves triangular in outline, base straight across to heart-shaped, tree broad-topped. Cottonwood, *Populus deltoides*, Fig. 47.

49 Teeth small, numerous, leaves up to 3" long. Quaking Aspen, *Populus tremuloides*, Fig. 48.

49 Teeth larger, fewer, leaves 3" to 6" long. Large-toothed Aspen, *Populus grandidentata*, Fig. 49.

50 Leaves broadly heart-shaped, coarsely toothed. Basswood, *Tilia americana*, Fig. 50.

50 Leaves long and narrow or oval in outline, not broadly heart-shaped—51.

51 Leaves with three main veins branching from the base of the blade, blade broadest at the base and tapering toward the tip, base heart-shaped. Hackberry, *Celtis occidentalis*, Fig. 51.

51 Leaves with one main vein from the base of the blade, blade broadest toward the center—52.

52 Leaves very coarsely toothed with comparatively few teeth along the edge—53.

52 Leaves finely toothed with numerous fine teeth along the edge—54.

53 Leaves short, 3" to 6" long, teeth usually short, edge often silky-hairy. Beech, *Fagus grandifolia*, Fig. 52.

53 Leaves long, 6" to 9" long, teeth longer, gland tipped, edge not silky-hairy. Chestnut, *Castanea dentata*, Fig. 53.

54 Leaves long and narrow, lance-shaped. Willows, *Salix* species, Fig. 54.

54 Leaves short and broad, oval in outline—55.

55 Leaves leathery, shining on upper surface. Pear, *Pyrus communis*, Fig. 55.

55 Leaves thinner, dull on upperside—56.

56 Leaves with rounded teeth, persistently hairy below, mostly rounded at the base. Apple, *Pyrus Malus*, Fig. 56.

56 Leaves with fine, sharp teeth, silky-hairy when young, more or less losing this when old, mostly heart-shaped at the base. Shadbush, Juneberry, *Amelanchier canadensis*, Fig. 57.

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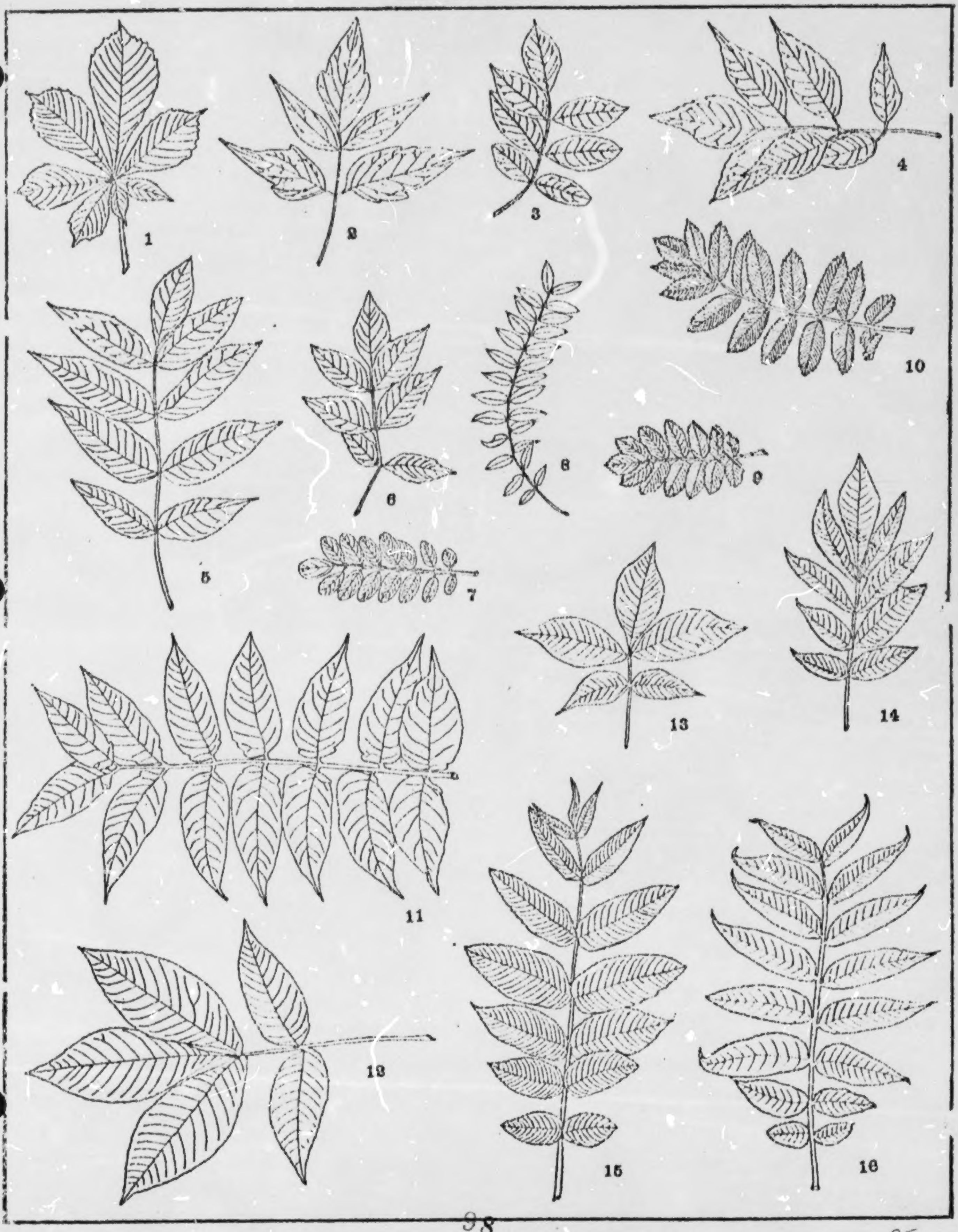
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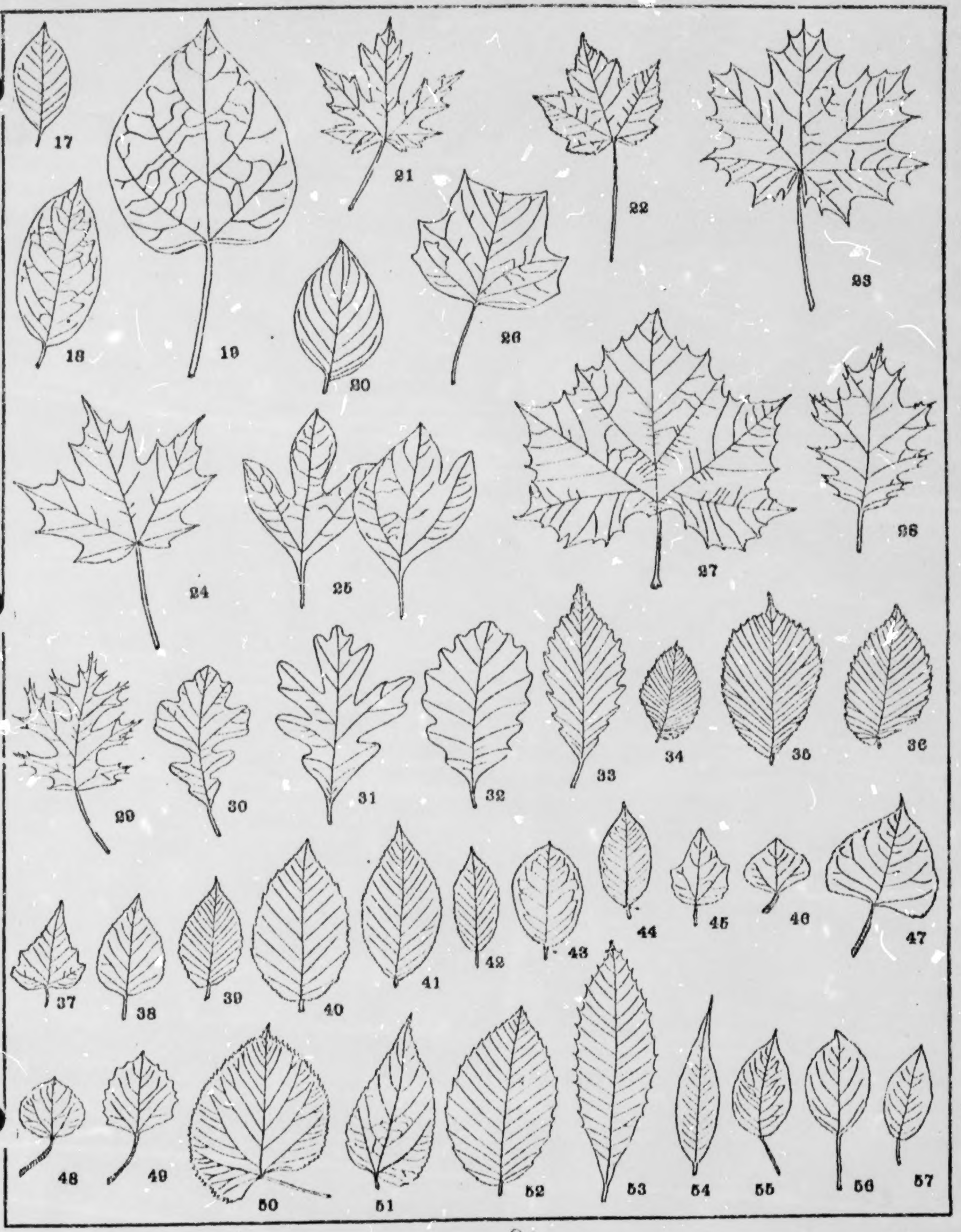

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Hubbard, Iowa

COMMON TREES AND THEIR TWIGS

by JOHN W. THOMSON

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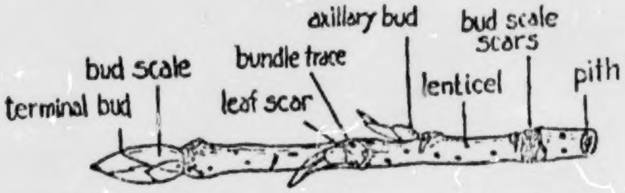
The University of Wisconsin

Line drawings by the author
Photographs courtesy of Rutherford Platt

DAVID E. YOUKER
Hubbard, Iowa

Leaf scars often look like faces—the camel (left) is the Butternut; the fellow with the dunce cap (right) is the leaf scar and bud of the American Elm.

What an interesting world awaits those who can enjoy the out-of-doors in frost and winter weather. The trees, so bleak and bare, really become old friends to be recognized by their shapes and by the scars and buds upon their branches. Become an initiate in the art of recognizing trees without their leaves and you add a new interest and a new pastime to your winter activities. It is not a difficult art, this recognizing of old friends in their cold weather garb. Learn a few new characters, try the Key on the nearest tree, and you are off on a winter adventure.



Cottonwood poplar twig showing parts used in naming winter twigs.

If you examine a twig of a tree such as a poplar, you will find a terminal bud at the tip. Along the side of the twig are the leaf scars, marking the place where the stalk of the leaf dropped off in autumn. Above each leaf scar is an axillary bud. The buds are protected by bud scales and contain the embryonic leaves and flowers which will open up in the spring. In each leaf scar are a number of raised dark marks called the bundle traces. These show where the fibrovascular bundles, or strands which bring water and minerals to the leaf and prepared food from it, passed from the stem to the leaf. The traces are usually quite conspicuous and definite in arrangement, if not in number, for a given species of tree. A tiny scar to each side of the top of the leaf scar, the stipule scar, shows where the stipules, tiny appendages at base of leaf stalk, have dropped off. Clusters of ring-like, narrow scars, the bud scale scars, indicate the former positions of the terminal bud and mark off one year's growth from another. These scars persist for several years but eventually growth of the twig in thickness obliterates them. On the twigs swollen dots called lenticels are usually conspicuous. These are spongy

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pores through which gas exchanges take place. The scars and the buds are the most useful characters in naming the trees in winter. Frequently trees have two types of buds, some larger than others. The larger buds usually open to produce flowers and the smaller buds usually produce leaves and branches. Elms and blue beech show quite a marked difference in the bud sizes.

In using the Key to trees in this bulletin a hand lens or other magnifying glass will be of great help in observing the bundle traces, stipule scars, and other small characters. The key is so constructed that by following one of each pair of choices one should arrive at the name of the tree. The twig may then be compared with the picture. If they do not agree, another trial should be made. The most difficult choice is number 27. If a terminal bud is lacking, a tiny stub, the real tip of the twig, shows under a hand lens on the side of the twig opposite the leaf scar. Trees not included in this bulletin may be identified by using one of the more inclusive references listed herein.

A KEY TO COMMON BROAD-LEAVED TREES IN WINTER

1 Leaf scars opposite or in groups of three. 2

1 Leaf scars alternate. 15

  2 Leaf scars often in groups of three. Catalpa, *Catalpa speciosa*, Fig. 1.

  2 Leaf scars opposite. 3

3 Bud lacking on tip of twig; pith chambered. Imperial tree, *Paulowina tomentosa*, Fig. 2.

3 Bud present on tip of twig; pith uniform, 4

  4 Terminal bud ½ in. or more long; buds sticky; twigs stout. Horse chestnut, *Aesculus hippocastanum*, Fig. 3.

  4 Terminal bud less than ½ in. long; buds not sticky; twigs more slender. 5

5 Only two bud scales visible on leaf buds. 6

5 Leaf buds showing four or more bud scales. 7

  6 Leaf scars raised [illegible] bases of leaf stalks and hiding the minute buds on the sides of the twigs; large terminal flower buds with 4 scales on some twigs. Flowering dogwood, *Cornus florida*, Fig. 4.

  6 Leaf scars on surface of twigs; buds plainly visible, all with 2 scales. Black haw, *Viburnum prunifolium*, Fig. 5.

7 Bundle scars three or in three groups. 8

7 Bundle scars many, minute, more or less continuous. 12

  8 Buds ⅛ to ¼ in. long; twigs not exuding milky juice when cut. 9

  8 Buds ¼ in. long; twigs exuding milky juice when cut. Norway maple, *Acer platanoides*, Fig. 10.

9 Buds white, woolly; twigs usually with a whitish bloom; fruits persistent. Box elder, *Acer negundo*, Fig. 6.

9 Not showing these characters. 10

  10 Buds reddish or greenish; twigs bright red. 11

  10 Buds brownish; twigs brownish or grayish. Sugar maple, *Acer saccharum*, Fig. 9.

11 Twigs rank smelling when broken. Silver maple, *Acer saccharinum*, Fig. 7

11 Twigs not rank smelling when broken. Red maple, *Acer rubrum*, Fig. 8.

  12 Terminal bud black; leaf scars vertically elliptical. Black ash, *Fraxinus nigra*, Fig. 11.

  12 Terminal bud brownish; leaf scars crescent-shaped. 13

13 Leaf scars deeply concave at top. White ash, *Fraxinus americana*, Fig. 12.

13 Leaf scars nearly straight at top. 14

  14 Twigs nearly hairless. Green ash, *Fraxinus pennsylvanica var. lanceolata*, Fig. 13.

  14 Twigs velvety, Red ash, *Fraxinus pennsylvanica*, Fig. 14.

15 Plants spiny. 16

15 Plants not spiny, 18

  16 Spines branched. Honey Locust, *Gleditsia triacanthos*, Fig. 15.

  16 Spines not branched. 17

17 Spines stout, paired, one on each side of leaf scar. Black Locust, *Robinia pseudoacacia*. Fig. 16.

17 Spines slender, not paired, one at a leaf scar. Hawthorn, *Crataegus*, Fig. 17.

  18 Pith chambered, the chambers often stuffed. 19

  18 Pith not chambered. 24

19 Pith chambered but not stuffed. 20

19 Pith chambered with the chambers stuffed. 21

  20 Pith dark brown; leaf scar with downy pad above. Butternut, *Juglans cinerea*, Fig. 18.

  20 Pith cream colored; no hairs above leaf scar. Black walnut, *Juglans nigra*, Fig. 19.

21 Buds with two scales showing. 22

21 Buds with four scales showing. 23

  22 Buds flat and blunt, end bud present; stipule scars encircling twig. Tulip tree, *Liriodendron tulipifera*, Fig. 20.

  22 Buds small, oval, no end bud; no stipule scars; twigs hairy. Persimmon, *Diospyros virginiana*, Fig. 21.

23 Stipule scars present; bark of trunk with corky warts. Hackberry, *Celtis occidentalis*, Fig. 22.

23 Stipule scars absent; bark without corky warts. Sour gum, Tupelo, *Nyssa sylvatica*, Fig. 23.

  24 Twigs bright green, very aromatic when broken, turning upward at the tips. Sassafras, *Sassafras albidum (variifolium)*, Fig. 24.

  24 Twigs without this combination of characters. 25

25 Buds with only a single scale exposed, fitting as a conical cap on the bud. 26

25 Buds with two or more scales exposed. 27

  26 Bud projecting from twig; stipule scars encircling twig; bundle scars 5—9. Sycamore, *Platanus occidentalis*, Fig. 25.

  26 Buds pressed against twig; stipule scars small or absent; bundle scars 3. Willows, *Salix*, Fig. 26.

27 True terminal bud absent so that the bud on the end of the twig is borne a little to one side of the tip. 28

27 True terminal bud present and at the tip of the twig. 40

  28 stipule scars present. 29

  28 No stipule scars present; twigs stout; leaf scars large, shield-shaped. Ailanthus, *Ailanthus altissima*, Fig. 39.

29 Staminate catkins (pollen-bearing) on the branches. 30

29 No staminate catkins on the branches. 34

  30 Bark peeling in large plates, smooth, papery; lenticels horizontal; short side twigs common. 31

  30 Bark shedding in narrow strips; lenticels not horizontal; short side twigs lacking. Hop hornbeam, *Ostrya virginiana*, Fig. 31.

31 Twigs with wintergreen flavor; bark of trunk brown or yellow. 32

31 Twigs lacking wintergreen flavor; bark of trunk light. 33

  32 Bark red brown. Black birch, *Betula lenta*, Fig. 27.

  32 Bark yellowish to silvery gray. Yellow birch, *Betula lutea*, Fig. 28.

33 Twigs sometimes hairy; trunk or tree lacking dark inverted V below branches. Paper or Canoe birch, *Betula papyrifera*, Fig. 29.

33 Twigs resinous, warty, hairless; trunk with dark inverted V-shaped marking below branches. Gray birch, *Betula populifolia*, Fig. 30.

  34 Buds sunken in the bark, several, one above the other, above each leaf scar. Kentucky coffee tree, *Gymnocladus dioica*, Fig. 32.

  34 Buds not sunken in the bark. 35

35 Pith star-shaped in cross-section; buds with three scales showing. Chestnut, *Castanea dentata*, Fig. 33.

35 Pith round in cross section; two or more than three bud scales showing. 36

  36 Outer bud scale shorter, making bud very lopsided, usually two or three scales showing. Basswood, *Tilia americana*, Fig. 34

  36 Buds not markedly lopsided, usually four or more scales showing. 37

37 Bark of trunk smooth, fluted; buds [illegible]. American hornbeam, blue beech, *Carpinus caroliniana*, Fig. 35.

37 Bark of trunk furrowed, scaly; buds placed to one side of leaf scar. 38

38 Buds rusty-hairy. Slippery elm, *Ulmus fulva*, Fig. 36.

38 Buds brown, not rusty-hairy. 39

39 Buds downy-hairy; twigs with corky ridges. Cork elm, *Ulmus racemosa*, Fig. 37.

39 Buds hairless; twigs not corky ridged. American elm, *Ulmus americana*, Fig. 38.

40 Bundle scars three or in three groups. 41

40 Bundle scars four to many. 54

41 Stipule scars present. 42

41 Stipule scars absent. 52

42 Pith star-shaped. 43

42 Pith circular. 49

43 First scale of axillary buds directly over the leaf scar; twigs brittle. 44

43 First scale of the axillary bud to one side of the center of the leaf scar; twigs not brittle. Chestnut, *Castanea dentata*, Fig. 35.

44 Branches erect, running up along the trunk. Lombardy poplar, *Populus nigra*, Fig. 40.

44 Branches spreading. 45

45 Terminal buds ½ to 1 in. long, sticky. 46

45 Terminal buds ⅛ to ⅓ in. long, not sticky. 47

46 Buds ½ in. long; twigs yellow. Cottonwood, *Populus deltoides*, Fig. 41.

46 Buds 1 in. long; twigs red-brown. Balsam poplar, *Populus tacamahacca*, Fig. 42.

47 Buds and twigs more or less white-downy; twigs green. Silver poplar, *Populus alba*, Fig. 43.

47 Buds and twigs not white-downy; twigs reddish-brown. 48

48 Terminal buds ⅛ in. long, dusty looking. Large-toothed aspen, *Populus grandidentata*, Fig. 44.

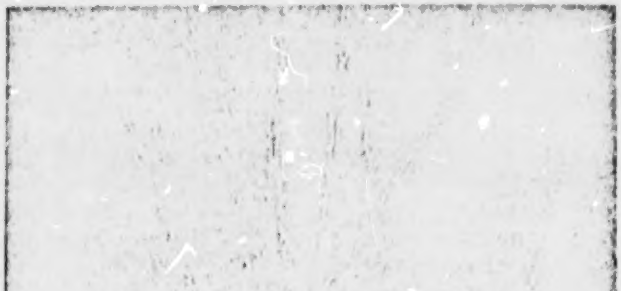
48 Terminal buds ¼ in. long, lustrous. Quaking aspen, *Populus tremuloides*, Fig. 45.

49 Axillary buds offset to one side of leaf scars; stipule scars nearly meeting around twig; buds slender, 1 in. long. Beech, *Fagus grandifolia*, Fig. 46.

49 Axillary buds above the leaf scars; stipule scars short; buds up to ½ in. long. 50

50 Buds clustered at the tips of twigs; twigs less than 1/16 in. thick; pith brown. Pin cherry, *Prunus pennsylvanica*, Fig. 47.

50 Buds not clustered; twigs more than 1/16 in. thick; pith white. 51



White Oak in Winter

51 Buds ¼ in. or less long, scales uniformly colored. Wild Black cherry, *Prunus serotina*, Fig. 48.

51 Buds ¼—½ in. long, scales grayish at edges. Choke cherry, *Prunus virginiana*, Fig. 49.

52 Buds long-pointed, conical. Shadbush, Serviceberry, *Amelanchier canadensis*, Fig. 50.

52 Buds short, blunt-ovoid. 53

53 Buds hairless. Pear, *Pyrus communis*, Fig. 51.

53 Buds woolly. Apple, *Malus pumila*, Fig. 52.

54 Bundle scars in a single U-shaped line. 55

54 Bundle scars grouped or scattered, not in a line. 56

55 Buds woolly. Rowan tree, *Sorbus aucuparia*, Fig. 53.

55 Buds gummy. Mountain Ash, *Sorbus americana*, Fig. 54.

56 Buds sulphur-yellow. Butternut, *Carya cordiformis*, Fig. 55.

56 Buds brown or gray. 57

57 Buds clustered toward end of twigs; pith star-shaped in cross section. 58

57 Buds not clustered toward end of twigs; pith circular in cross section. 64

58 Buds with a sharp point. 59

58 Buds with a blunted point. 62

59 Buds ⅜ in. to ½ in. long. 60

59 Buds ¼ in. or less long, gray and hairy on upper half, smooth and reddish on lower half. Scarlet oak, *Quercus coccinea*, Fig.

60 Buds grayish or yellow-brown, hairy all over. Black oak, *Quercus velutina*, Fig. 56.

60 Buds smooth, not entirely hairy. 61

61 Buds dark red-brown, shining, hairy at tip. Red oak, *Quercus borealis*, Fig. 57.

61 Buds light brown or yellow, edges of the scales sometimes hairy. Chestnut oak, *Quercus montana*, Fig. 58.

62 Twigs and buds finely gray hairy; older twigs with corky ridges. Bur oak, *Quercus macrocarpa*, Fig. 60.

62 Twigs smooth, hairless. 63

63 Bark on branches peeling off in papery scales; buds yellow to yellow-brown, hairy above the middle. Swamp white oak, *Quercus bicolor*, Fig. 61.

63 Bark on branches not breaking into large papery scales; buds smooth, red-brown. White oak, *Quercus alba*, Fig. 62.

64 Twigs thick (¼ in. in diameter). 65

64 Twigs thinner (⅛ in. in diameter); terminal bud small, 3/16 in. Pignut hickory, *Carya glabra*, Fig. 65.

65 Terminal bud large, ⅜ in.; branches gray or dark brown; bark shaggy; fruit a nut. Shagbark hickory, *Carya ovata*, Fig. 63.

65 Terminal bud small, 3/16 in.; branches gray or light red-brown; fruit clusters of white drupes; very poisonous to touch (wash with strong soap immediately). Poison sumac, *Rhus vernix*, Fig. 64.

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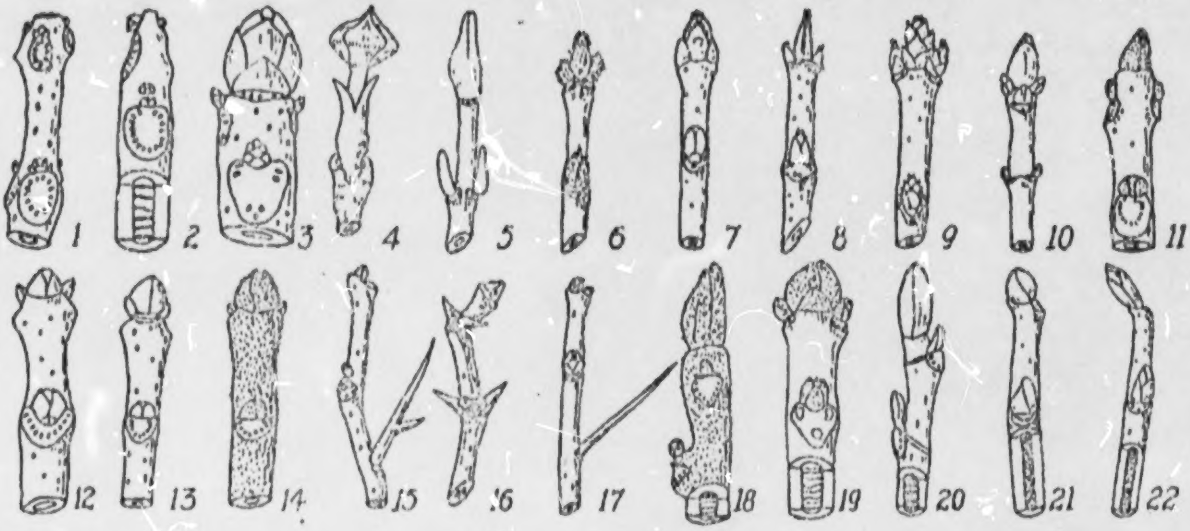
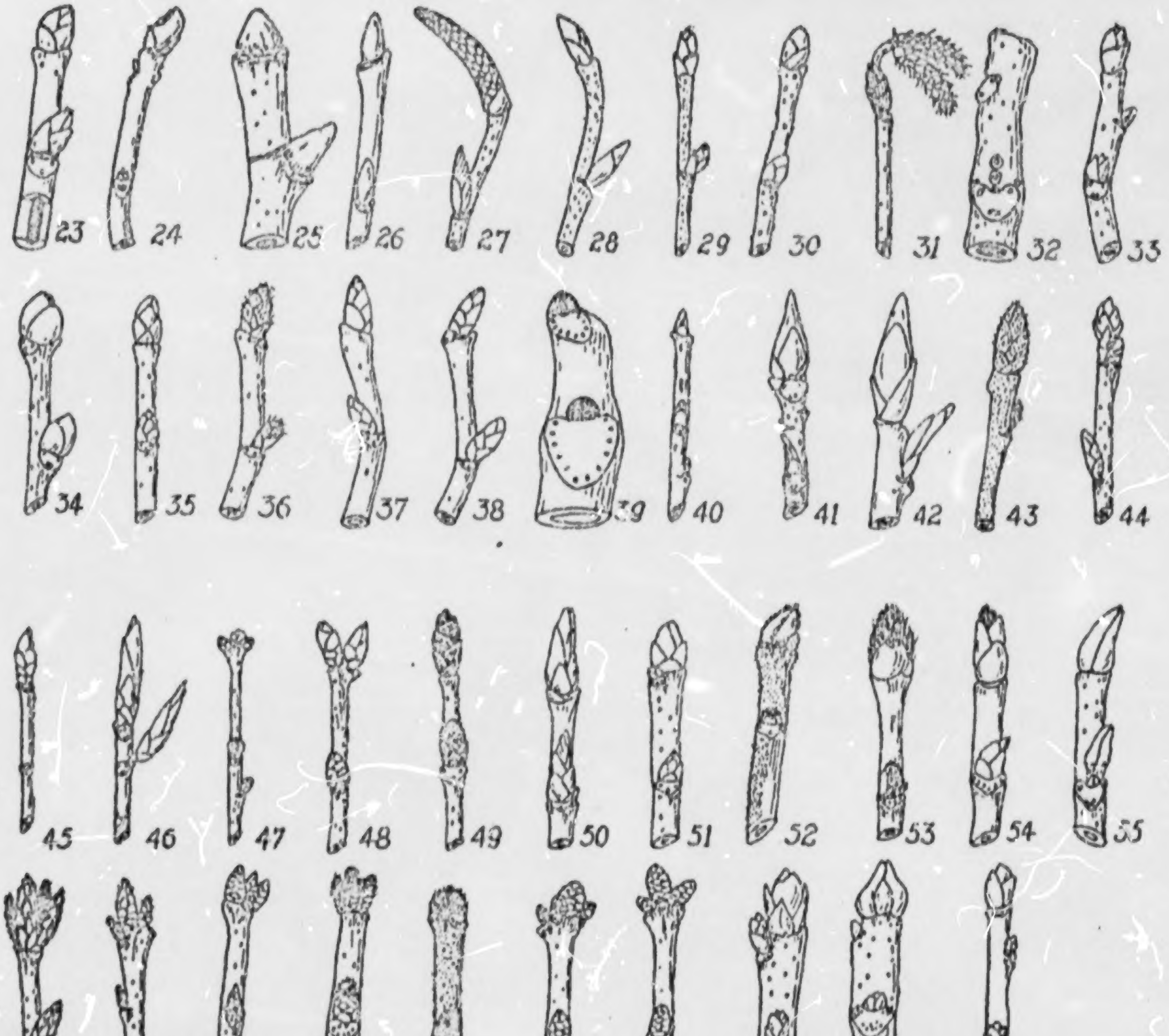




Summer School - Reading
Outdoor Activities

1. Blind Walk - walk around grounds blindfolded. Then discuss and write down impressions.

2. Read weather forecast in newspaper. Keep a written record of the outcome.

3. Make a map of trees, etc. around school grounds.

4. Plant a flower, tree or plant. Make daily observations and keep a written record of growth.

5. Write an original story and illustrate outdoors.

6. Treasure Hunt - Prepare directions which child must read and follow. The final object should be a reward.

7. List outdoor objects beginning (or ending) with certain sounds.

8. Take a newspaper or magazine and just read sitting under a tree.

9. Crossword puzzles - using outdoor items within our area.

10. Take a walk around grounds - then list as many things we saw that can be remembered.

11. Choose a bird, tree, flower, etc. and read about it.

12. Possibly a field trip could be arranged toward the end of summer school.

13. Scavenger Hunt - Put students in teams. First to complete list with "outdoor words" wins.
    Example: Something that cards must obey. It has a silent "g." (sign)

14. Mechanic - Take a class out to look at car engine. Show visible parts. List them. Take the words back to classroom. Take the words apart and put them back together again.

15. Word Safari - Take a hike. List any seen objects that fill the teacher's requirements, such as: ō, cl, ē, etc.

16. Relate all word lists to summer or outdoors.

17. Language experience approach related to outdoor education. Provide students with an outdoor experience. Have them write about it, using words they don't know how to spell. (increase their vocabulary)
    Example: Student follows ant along sidewalk.
    "How do you think the ant felt?"

18. Make a scrapbook filled with pictures the kids have taken. Each picture should have a caption or sentences telling why they took this particular picture. Children could also learn a sight vocabulary from words dealing with photography.

19. Bring binoculars to let children look through. For each child a questionnaire has been prepared. Such questions as: 1) how many trees do you see in that field? 2) write down the license number of one of the cars 3) how far can you see if you turn the binoculars around and look through the big end? 4) how far do you think you can see with the binoculars?, etc. Go over the answers with each child.

20. Have child choose some object outside and write it down on a piece of paper. Then have him try and rhyme as many words with it as he can, all the time writing them down. Tell the kids you will be comparing lists to see who has the longest list.

21. Have child list everything he sees on a piece of paper. Then have the child put the list in alphabetical order.

22. Explain the use of the compass and have the child demonstrate his understanding. Then work out a treasure hunt. He will read one message and proceed to the next message as he reads. His proper use of the compass and measurement as well as his reading skills will influence his success.

23. Have each child make a weather chart to prove that superstitions about weather are false. The chart may have various superstitions that will be disproved. The child (with the help of the teacher) will keep a record for the 6 weeks. These is a belief among some people that a crescent moon holds water and weather will be dry during that period. Others believe that the moon will dump water and it will be quite wet during that time. The idea about a haze or ring around the moon means rain the next day may also be disproved.

24. A chart with the colors crayoned in (red, orange, yellow, green, blue, violet) and a column underneath each color will be provided for each child. These are the natural colors from the sun. The use of a prism will help to make this more meaningful. Each child will list all the items he sees in nature or can think of in nature under the correct column. See who is able to get the most. This will promote interest in and observation of color in nature, along with further word recognition.

25. Have the child help collect different leaves. Identify each leaf. On oak tag outline the leaf, and across from it write the name of a different tree. Do this with many cards, until you have a set of matching cards. The game will be played like dominoes.

26. Select poetry and short stories with outdoor themes (trees, flowers, etc.) Print off copies for students. Read outside and discuss. Tie in how these articles are similar to their own surroundings. Integrate basic reading skills according to their levels.

7. Take listening walks and sight walks. When returned write experience stories. Also other types of creative writing. Trade and read each others stories.

28. Walks to read signs and traffic signs.

29. Bring news articles about environmental happenings. Use them as a reading source. (older students)

30. Make word cards for things associated with outdoors, types of trees, flowers, bugs. (younger children)

31. Various games and activities which are listed in the "Spice" handbook. This book contains many good games to use that cover reading skills.

32. From observing a natural setting, student is to write his feelings about it in form of poetry, essay, report or story.

33. Find a new and old decidious leaf, bark, rock, evergreen leaf, flower, spring water, stagnant water and observe it by looking at it, feeling it, smelling, listening, tasting it and writing down as many descriptive words.

34. Write an autobiography of a tree. Pick a tree and write its story. Using a leaf, a print will be made and will be included in report. Information about the tree will be found from tree books.

35. Hopefully, some old graveyard nearby will give resource for this project. After reading tombstones, write a story about the tombstone and what it represents.

36. As much as possible assignments or reading interests will be done out-of-doors by use of tape recorder and other "tools."

37. Baseball Phonics - Each child take a position for bases and the rest are up to bat. The teacher throws out a word like grass, the batter says "A short a sound and moves to 1st base if correct -- if not, one of the baseman corrects the batter and the batter is put out. If he goes on each team makes as many runs until the opposing team gets 3 outs. Purpose: stressing long and short vowel sounds, and blends.

How to Use the Arts in the Out of Doors

Arts and Crafts

Sketch - paint - color - sculpt things one sees outdoors.

Snow paint.

Sketch using charcoal or crushed rocks or plants.

Make plaster casts of animal tracks or sand casts.

Observe the various colors in one tree, or one flower, or one stream.

Make terrariums.

Dig, refine, and use native clay for modeling.

Carve tree fungus.

Whittle or carve wood.

Leaf printing.

Weave grasses, twigs, etc. -- or incorporate them in other weaving projects.

Use native materials for pictures, mats, arrangements, plaques.

Look for pictures in the clouds.

Find different designs and geometric figures in nature.

Music

Sing songs and rounds.

Compose songs -- music and lyrics.

March, dance, or skip to hurry back to lunch.

Make primitive instruments:
- Flutes with reeds
- Drums with hollow logs
- Rattles with bladder nuts
- Rhythm sticks with different kinds of woods.

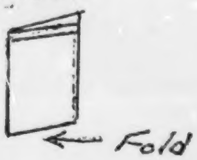
Make up a tune from the sounds of nature.

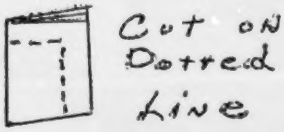
ART

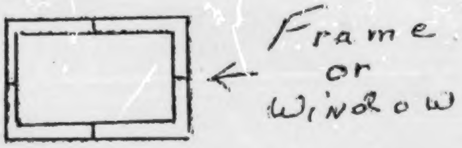
Stephen D. Olejnik
Peer Teaching 511

This short project I believe can be used for almost any grade level or any subject area. It centers around the construction of a simple window using a sheet of paper and a pair of scissors. After you've made one of these its uses are almost unlimited.

Fold the paper into four sections, making sure that your two folds cross in the center of the paper. With your scissors cut a large square out of the corner of the paper that is folded. As you open the outside edge that is left you will find that you now have a frame or window.







You may have used something of this type before, (plot study, ha, ha.) but my idea is mainly concentrated in the method in which this is used. This project could take 15 minutes or an hour depending upon the attention span of your students.

I've used this very successfully with 5th and 6th grade students in language arts. The procedure is as follows: Choose a site and place your frame on the ground (preferably in an area with low-lying plants or possibly none at all). This may be done systematically or at random. Then have the students describe the different objects that they find within their frame. The only restriction that you place on them is that they not refer to the object by name, i.e. don't allow them to call a leaf a fuzzy green leaf, but rather have them say that this object is green and fuzzy and thin, etc.

After your students have described six objects in their area have them visit the areas that other students have been working on and see if they can distinguish between the different objects by using the descriptions written by the student who has been working on that area.

Other alternatives for using this frame could be to sketch the different objects that you find in this area for an art project. Pencil sketches seem to work best for this. Take a census of the different types of plants that are found in this area (here it is not important for them to know what the plants are, but rather to be able to distinguish between different types). For primary students a race to see who could find the most colors in their area might be interesting for those teachers who are working with colors. In social studies you might even be able to find a particular plant or organism that is dominant in this area and develop some fairly reasonable discussions on this topic. And last but not least there is always the possibility of working on taxonomy with high school students.

DON'T FORGET TO ASK ME WHAT YOU CAN USE FILM CANISTERS FOR!!!!

Object and Leaf Prints

Materials:

ink
brayers
paper towels
newspaper
*glass

manilla paper)
construction paper) 9 x 12
newsprint)
tissue paper)

(paper towels are also good)

*A cookie sheet can also be used or the newspaper will give you their old printsheets. These are a thin aluminum, can be cut with scissors, the edges wrapped with masking tape, and can be disposed of when you're through.

Technique - Object Prints

For object printing, the object you are printing with is merely dipped in the ink, blotted on a paper towel and then pressed on a piece of paper.

Technique - Leaf Prints

There are two ways to do leaf prints. The first is to put your leaf under a piece of paper and roll an inked brayer over it. (It's best to roll the brayer on a paper towell first to remove excess ink.)

The second technique is done by placing your leaf on a piece of newspaper and applying ink directly to the leaf with a brayer. Place the inked leaf on a pice of paper, inked side down. Place a single sheet of newspaper on top and roll a dry brayer over the entire surface. Use steady and firm pressure. Remove the newspaper and the leaf to reveal your print.

Specific Activity: Field Art Project

Objective: The student as a result of the art project will:

a. produce an art project using native materials.
b. be able to identify shapes, colors, and textures in nature.

Learning Activity

The following are examples of simple art projects that could be done at Bluffville without extensive materials. The teacher is reminded to only use materials that are abundant and the depletion of which would not affect the ecosystem at Bluffville. The staff member in charge will set collecting policies as they will vary with season.

Burdock Art

Gather burdock burs. Shape into baskets. Fill the baskets with dried weeds, grasses, etc.
Shape the burs into animals, birds, or insects. Twigs or leaf stems may be used for legs, ears, and whiskers.

Leaf Art

Collect large leaves. Carefully break the stems from them. Overlap the leaves and use the stems as pins to fasten them together. Make headbands or leis. These may be decorated with flowers or other interesting plants. Use only weed flowers such as Queen Anne's Lace or abundant plants.

Weathered wood, bark, dried materials, or other natural materials.

Interesting arrangements may be made with weathered wood, bark, colored rocks, dried grasses and weeds, branches, or almost any material found on a field trip.

All of the above activities require no other materials than those found on a field trip.

Another idea might be to gather materials to take back to the classroom for a display. Again, rules need to be set on collecting.

Natural Soil

Blue clay - shape jar, vase, or some object.
Colored sand - sand paintings

Tracings - Sketches

Take chalk, crayon, or pencil to make tracings or sketches of natural materials.

Evaluation

The student will complete an art project using approved materials.

Ideas for Activities in the Winter
Outdoor Education Program

(1) Follow animal tracks -- bird tracks -- mouse tracks (tunnels under snow).

(2) Find winter homes of animals and insects: inside logs, nests, cocoons, galls, curled leaves.

(3) Discover shapes of trees in silhouette.
Identify by birds -- by leaf scars.
Make bark impressions with foil, or crayon on light-weight paper.

(4) Discover what is going on under:
Bark on rotten logs
Ice on creeks
Rocks
Leaves

(5) Discover what has happened to lichens, mosses, seed pods, funguses (fungi, to some).

(6) Take temperature in sunny spots, shady, near dark trunks as opposed to light areas in snow. Air as opposed to water. Observe how snow has melted around dark leaves, leaving them sunken in snow.

(7) See how many colors are visible (on tree trunks, ground, air, water, how many on snow and ice, etc.) Are birds and animals different colors than in summer?

(8) If snow is falling, catch snow flakes on dark material - magnify.

(9) If snow is drifted, observe distance between drifts; laying of drifts; compare drifts near deciduous and coniferous trees; near posts. Examine a cross-section of a drift.

(10) Some snow stumpers:
a. Put equal sized snowballs on sidewalk, a rock, some soil, grass, a car (or some kind of metal), a wooden table. In what order will the snowballs melt?
b. Put on top of snow the following:
paper - dark and light
leaves
rocks
sand
sugar
salt
Which melts fastest? What if snow is in shade? What if temperature is below freezing?
c. Color patches of snow with red and blue food coloring early in morning. At end of day, which has melted the most? Why?

(11) Slide down hills on pieces of cardboard or just on bottoms (fun with no cost).

(12) Draw pictures in snow using feet only.

(13) Make snow angels (easiest to make on a slope).

(14) Make snow men, snow forts, igloos or snow sculptures.

(15) Paint with tempera on snow.

(16) Play fox and goose.

(17) Take a nature scavenger hunt. (#4)

(18) Estimate distances -- then pace off, measure, etc.
(Review of fall math)

Craft Ideas for Winter

(1) Snow painting, snow sculpture, outlining with feet.

(2) Learn lashing - knots and hitches and their uses.

(3) Make arrangements of driftwood, twigs, cones, pebbles, lichen, fungus, seed pods, thistles.

(4) Sketch: snowflakes)
buds) with pencil, chalk
tree silhouettes) or NATURAL charcoal
landscapes)

(5) Make rock ornaments.

(6) Learn simple macrame' knots.

(7) Make impression prints of stumps, tree trunks, weeks, leaves.

(8) Make a map of castle area or one of campsites. This can be done to scale, or freehand, using symbols to mark landmarks.

(9) Make plaques on cardboard using only parts of natural materials (bit of **bark**, 1 part of cone or weed, seed, or twig, petal, needle, etc.) Nothing should **be whole.**

(10) Spatter print.

Use singing for part of crafts period or role-playing. Compose songs or poems.

Have students capture or defend the castle.

Have spelling bee using words in nature.